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ABSTRACT

The link between rapid population growth and the absolute poverty which currently afflicts 780 million people in developing countries (excluding China and other centrally planned economies) is examined. As a result of rapid population growth, many countries suffer slow per capita income growth, a lack of progress in reducing income inequality, and more poverty. Conversely, many characteristics of poverty, e.g., high infant mortality, lack of education for women, and inaccessibility of family planning, can cause high fertility. Experience in many countries shows, however, that birth rates can fall rapidly in low-income groups when basic health care, education, and low-cost or free family planning services are made widely available. Assuming that annual population growth averages 2.2 percent for 1975-2000 and total income growth rises to 6.2 percent per year, the numbers of poor people are projected to decline to 600 million in 2000. But slower than expected economic growth in the 1980's could raise the number, unless special efforts are made to ensure more equitable income distribtion and improvements in services to the poor in developing countries. (RM)

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Population Growth and Poverty in the Developing World

By Nancy Birdsall

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Abstract—This *Bulletin* examines the links between rapid population growth and the absolute poverty which currently afflicts 780 million people in the developing world (excluding China and other centrally planned economies), defined as having less than the income necessary to ensure a daily diet of 2,150 calories per person ($200 per person a year in 1970 U.S. dollars). Rapid population growth stretches national and family budgets thin with the increasing numbers of children to be fed and educated and workers to be provided with jobs. The probable consequence is slower per capita income growth, lack of progress in reducing income inequality, and more poverty. Conversely, many characteristics of poverty can cause high fertility (the main component of rapid population growth)—high infant mortality, lack of education for women in particular, too little family income to "invest" in children, inequitable shares in national income, and inaccessibility of family planning. Experience in China, Indonesia, Taiwan, Colombia, Korea, Sri Lanka, Cuba, and Costa Rica shows, however, that birth rates can fall rapidly in low-income groups and countries when basic health care, education, and low-cost or free family planning services are made widely available. Assuming that annual population growth averages 2.2 percent for 1975-2000 (down from 2.5 percent for developing countries in 1960-75) and total income growth rises to 6.2 percent per year, the numbers of poor people are projected to decline to 600 million in 2000. An average 1.9 percent population growth rate, now considered more likely for developing countries, would further reduce the number. But slower than expected economic growth in the 1980s could *raise* the number unless special efforts are made to ensure more equitable income distribution and improvements in services to the poor in developing countries.

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UNICEF photo by Adrian Clark

An Ethiopian woman and her child. As of 1980, an estimated 780 million people in the developing world (excluding China and other centrally planned economies) live in absolute poverty.

Population Growth and Poverty in the Developing World

By **Nancy Birdsall**
World Bank

Developing countries are like long-distance runners, racing against time to eliminate poverty. For all of them, rapid population growth is a burden which slows them down. A quick glance at the race also shows it is an unfair one. The weaker runners are those advancing most slowly and already behind the pack. They also have the highest population growth rates and are thus the most severely handicapped.

In this *Bulletin* we look at this apparent close association between poverty and rapid population growth and consider why and how the two are mutually reinforcing. It should be emphasized at the outset that, though poverty and rapid population growth are strongly, indeed, as we hope to show, causally linked, neither is the sole determinant nor the inevitable consequence of the other. In fact, at the country level, counterexamples abound. Rapid population growth has accompanied rapid economic growth in Brazil; slower population growth has accompanied slower economic growth in India and Sri Lanka. Elimination of poverty within a "reasonable" time may be possible for a few developing countries despite their population burden—those with unusual natural resources such as the oil-exporting countries, for example, or those already running fast and light due to prior development policies or a head start in the economic growth race. And for the weaker runners, reducing the population burden is no panacea; more direct attacks on poverty and slow economic growth are necessary. However, there is no runner for whom a lighter burden would not speed the pace. And within every country, for any given amount of resources, the depth and incidence of poverty could be reduced with a lower rate of population growth.

This Bulletin *is based on* Population and Poverty in the Developing World, *World Bank Staff Working Paper No. 404, July 1980, prepared by Nancy Birdsall as a background study for the* World Development Report, 1980 *of the World Bank. The Population Reference Bureau is grateful to the World Bank for permission to present this adapted summary.*

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We begin by explaining our working definition of poverty and suggesting some links between poverty and demographic trends in the developing world. We then consider the *effects* of rapid population growth on the situation of the poor. These effects operate at the national level by reducing the per capita availability of investment resources; as the poor are usually the last in line for jobs, school places, and public health services, rapid population growth can hurt them disproportionately. The effects also operate at the family level, by reducing parents' health and educational investments in each child; since the poor tend to have large families, poor children are often particularly disadvantaged. Next we ask whether and to what extent low income, lack of education, and poor health *cause* high fertility, the major contributor to rapid population growth. This requires a closer look at the family as an economic and social unit. Finally we discuss family planning, in particular the evidence regarding the access of the poor to family planning services. Reducing population growth is not an end in itself but one among several means of improving human welfare. Provision of family planning services, however, serves *both* as a means of fertility reduction and as an end.

Poverty and Demography in the Developing World

Defining poverty

By poverty we mean not only low income, but also the lack of education, malnutrition, poor health, and low life expectancy that usually, though not always, go along with extremely low incomes. Most people can agree on this very general definition of poverty. But to discuss poverty and its relation to population growth and change, we require, if not a more specific definition of poverty (by which all individuals could be sorted into "poor" and "nonpoor"!), at least a measure, comparable across countries, of the approximate numbers of those who suffer some or all of these disadvantages. We want a measure which is comparable across countries because much of the data on demographic rates is still restricted to countrywide averages.

Research by Hollis Chenery and associates at the World Bank suggests that, in 1975, there were 800 million people living in absolute poverty in developing countries (excluding China and other centrally planned economies), or almost 40 percent of the population in those countries. For 1980, the figure is about 780 million.[2] The *proportion* of people in absolute poverty in developing countries as a group has fallen over the past two decades. But because population has grown, the *number* of poor people has increased.

Chenery and his colleagues chose as the poverty cutoff line the amount of spending needed to ensure a minimum daily diet of 2,150 calories per person, based on expenditure patterns of the population of India.[3] When converted to U.S. dollars using an exchange rate which takes into account differences in country prices, this line corresponds to an annual income per person of $200 in 1970 U.S. dollars. It is applied in different countries by using data on per capita income and income distribution.

How does this calorie-based poverty line translate into non-income factors we associate with poverty?

In Indonesia and Sri Lanka, households below the line spend more than 80 percent of their income on food. In Indonesia, almost three-quarters of that spending goes for non-protein staples: corn, cassava, and rice. In Brazil, the heads of households defined as poor in this way had spent on average about one year in school and most are illiterate. Six out of ten of their children aged eight to ten had never been to school or had already dropped out. In Colombia,

World Bank photo by Jaime Martin-Escobal

Boys benefit from a school lunch program in Ecuador. Absolute poverty is defined as having less than enough income to ensure a minimum daily diet of 2,150 calories per person.

one of every ten children born to poor parents dies by age five, a rate double that among the non-poor.[4]

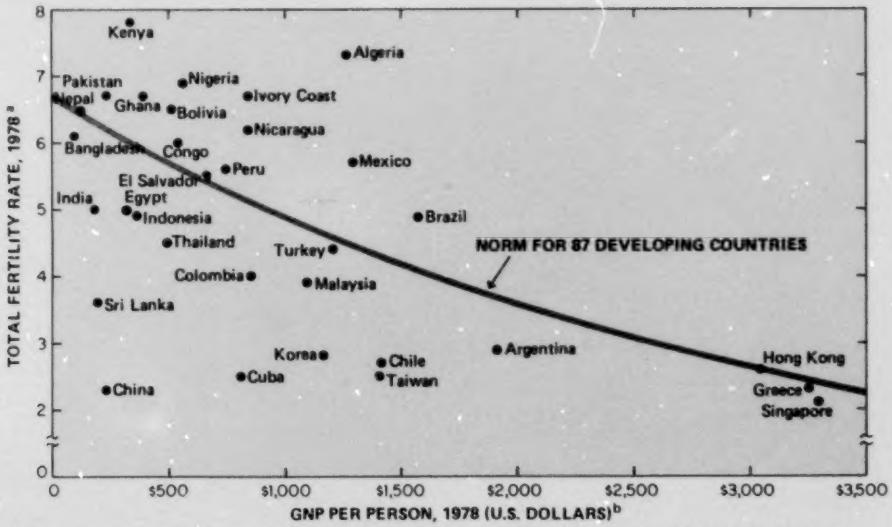
In general, the poorest countries of the world have the greatest proportions of absolutely poor people. In India, Bangladesh, Indonesia, and many countries of sub-Saharan Africa, where average income per person is less than $400, about half of the people have incomes below the $200 line. Where average incomes are somewhat higher, as in the Philippines, Thailand, and Morocco, about one-third are below the line. In the still better-off developing countries of Latin America—Brazil, Mexico, and Venezuela—and in Iran and Turkey, where per capita income is over $1,000, about 13 percent are below the line.

But there are exceptions. Because of differences in income distribution, the proportion of the population below the poverty line in 1975 was about the same in Brazil as in Sri Lanka although Brazil's average income—using the price-adjusted exchange rate—was over twice that of Sri Lanka in that year. Income per person was about the same in South Korea, Zambia, and Colombia in 1975, but the percentage of the population in poverty in Colombia (19 percent) was twice that in the other two (8 percent in Korea and 10 percent in Zambia).[5] Moreover, income alone, even taking into account its distribution, does not tell the whole story of poverty. Low-income households with access to free or low-cost health care, schools, transportation, and public sanitation, as in China and Cuba, are less "poor" than comparable households in countries with fewer of these publicly provided services.

Income, fertility, and life expectancy

As with absolute poverty, there is also a strong correlation between income per person and levels of fertility and life expectancy. In general, the higher a country's GNP (gross national product) per person, the lower its fertility and the higher its life expectancy, as seen in Figures 1 and 2 (next page). The curved lines in the figures show the statistically-expected relationship between fertility and country GNP per person (Figure 1) and life expectancy and GNP per person (Figure 2)—"expected" on the basis of the total fertility rate, life expectancy, and GNP per person of over 80 developing countries in 1978. A selection of these countries and their locations on the graphs are shown in each figure. For the most part, countries with the highest fertility and lowest life expectancy have the lowest incomes per person—India, Bangladesh, Pakistan, Nepal, and most countries of sub-Saharan Africa. Those with lower fertility and higher life expectancy, such as Malaysia, Hong Kong, and Chile, have higher incomes. Indeed, among the countries analyzed, more than 50 percent of

Figure 1. Fertility in Relation to Income: Developing Countries, 1978



Source: Updated from Nancy Birdsall, *Population and Poverty in Developing Countries*, World Bank Staff Working Paper No. 404 (Washington, D.C.: 1980) Figure 1-3B. See Appendix B of that paper for an explanation of the procedure used to derive the line shown. China and Cuba are not included in the estimation of this line, but their locations on this *Bulletin* figure do indicate their total fertility rate and GNP per person in 1978, as estimated by the World Bank.

[a]The total fertility rate indicates the average number of children that would be born to each woman in a population if each were to live through her childbearing years (usually considered ages 15-49) bearing children at the same rate as women of those ages actually did in a given year.

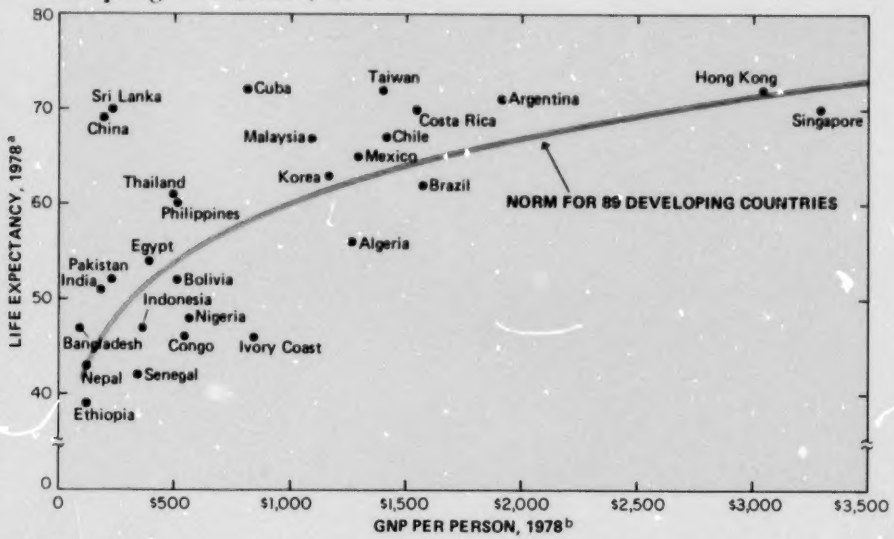
[b]GNP (gross national product) per person is the value of goods and services produced in a country, plus net income received from abroad from investments and citizens' earnings outside the country, per person residing in the country in a given year.

the variance in their demographic measures can be accounted for, in a statistical sense, by their per capita incomes alone.

Still, as with the relationship between absolute poverty and income, the association is far from perfect, and much can be learned from the exceptions. Countries which fall furthest from the lines in the figures are those in which actual fertility or life expectancy was most different from what income alone would suggest. In Figure 1, countries with lower fertility than might be expected given their low income per person include China, South Korea, Sri Lanka, Cuba, Chile, and Colombia. Those whose fertility is higher than might be expected for their relatively high GNP per person include Mexico, Ivory Coast, and Algeria. (Figure 1 omits the oil-exporting countries of Iran, Iraq, Libya, Saudi Arabia, and Venezuela whose fertility is very high, given their high incomes per person.)

The exceptions call attention to certain factors which modify the simple negative association between income per person and fertility and the positive association between income and life expectancy. One obvious factor is the distribution of income within a country and thus the percentage of the population in poverty. Great inequality in the

Figure 2. Life Expectancy in Relation to Income: Developing Countries, 1978



Source: See Figure 1.

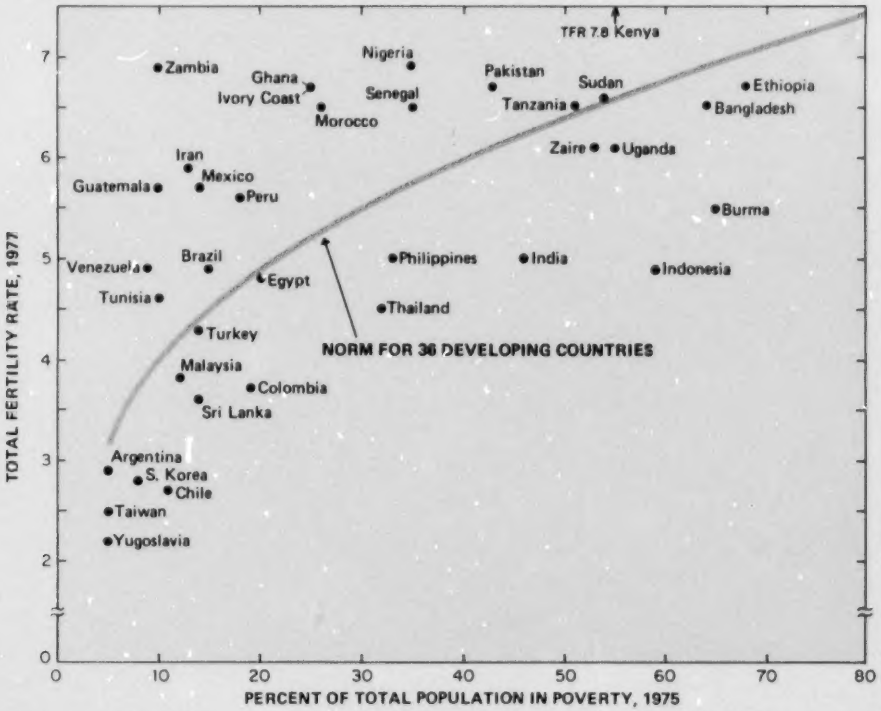
[a]Life expectancy at birth is the average number of years a newborn could be expected to live if current mortality conditions were to continue throughout his or her lifetime.

[b]GNP per person, see Figure 1.

distribution of income is one possible explanation for high fertility rates in certain Latin American countries such as Mexico, Brazil, and Venezuela where per capita incomes are higher than in Asia. Figure 3 (next page) allows for this possibility. It shows the relationship between 1977 fertility rates and the percent of population below the $200 per person poverty line in 1975 for the 36 countries for which the latter information is available. Countries which have higher fertility than might be expected, given relatively smaller percentages of the population in poverty, include Zambia, Iran, Mexico, Guatemala, Venezuela, and the Ivory Coast. Those with lower than expected fertility for their level of poverty include Taiwan, Colombia, Sri Lanka, Indonesia, and Thailand.

What other factors besides income distribution are affecting these rates of fertility and life expectancy? At least two are surely important: the distribution of health and education services, which is often, but not necessarily associated with income distribution, and, with regard to fertility, the access of the poor to family planning services. The fact that health and education services are accessible to the poor may explain the relatively low fertility and high life expectancy of Sri Lanka, Taiwan—and of China (for which we lack the data to include it in Figure 3). Availability of family planning services appears to have contributed to relatively low fertility in Thailand, Colombia, and, most recently, Indonesia. The reason health, education, and family planning matter and the way they interact with fertility and poverty are the subject of two later sections in this *Bulletin*.

Figure 3. Fertility, 1977, in Relation to Percent of Population in Poverty, 1975: 36 Developing Countries



Sources: Percent of population in poverty: Hollis Chenery, with Montek S. Ahluwalia and Nicholas G. Carter, "Growth and Poverty in Developing Countries," in Hollis Chenery, *Structural Change and Development Policy* (New York: Oxford University Press for the World Bank, 1979) Table 11-1, p. 472. Total fertility rate: World Bank, *World Development Report, 1979*.

Note: The line shown is derived from a cross-country equation relating the total fertility rate to the percent of population in poverty among 36 developing countries. Equation results are available from the *Bull*[illegible] author.

Demographic change and poverty

In the developing world, which contains three-quarters of the world population of 4.4 billion in 1980, rates of natura' increase (births minus deaths) have been unprecedentedly rapid since World War II—2 to 3 percent a year in most countries. This has meant a doubling of population size in the last 30 years. In the now-developed countries, by contrast, annual natural increase seldom climbed above 1.5 percent as they went through their "demographic transition" from high to low rates of fertility and mortality and now stands at 0.6 percent for these countries as a whole, implying a population doubling time of 111 years.[6] However, the developing world's population growth rates have been declining since about 1965, even if very slowly.

The rapid postwar growth was the result of steep declines in mortality combined with continued high fertility. The

recent slowdown in growth results from a slowdown in the pace of mortality decline coupled with the rapid fertility decline now occurring in many less developed countries. In China and India, the world's most populous countries, birth rates have declined by at least 15 percent since 1965. The decline has been between 10 and 30 percent in other major developing countries—Indonesia, Thailand, the Philippines, Turkey, Egypt, Korea, Brazil, and Mexico.[7] World Bank projections (which are generally consistent with United Nations projections) assume that fertility will continue to fall in the middle-income countries of East Asia and Latin America and in some parts of South Asia, and that the decline will spread to the rest of South Asia and Africa by the late 20th century.

Even with these fertility declines, however, the population of developing countries is projected to increase from 3.3 billion in 1980 to almost 4.9 billion in the year 2000, while total world population mounts from about 4.4 billion to almost 6 billion. Though growth rates will be lower, they will apply to ever-burgeoning absolute numbers of people so that by 2000 the annual population increase in the less developed countries as a whole will be 76 million, compared to about 64 million today. (The total world population will be growing by some 93 million a year in 2000, up from 74 million a year currently.[8]) Even with the projected fertility declines, the World Bank calculates that India will grow from 672 to 974 million between 1980 and 2000; Brazil from 126 to 201 million; and Nigeria from 85 to 153 million.[9]

What have these past and projected demographic trends to do with poverty?

Mortality change and poverty. Mortality in the developing countries has fallen more rapidly and at income and education levels lower than those associated with mortality decline in the West. For example, the death rate in India, Pakistan, and what is now Bangladesh fell from about 25 to 15 per 1,000 population between 1950 and 1970. In 1970 per capita income in those countries was still below $200 and fewer than 40 percent of adults were literate. In Western Europe in 1900, death rates were still above 20 per 1,000 population although in most countries at least 90 percent of adults were literate according to modern-day estimates.[10] Analysis using country-level data suggests that until recently a good deal of the post-World War II mortality decline in developing countries has been due to the introduction of new public health technologies, such as mass vaccination against smallpox and DDT spraying to combat malaria, which reduced mortality irrespective of family income, nutritional levels, availability of clean water, or personal health practices. Of course, increases in income and education also played a role; they explain some 50 percent of the drop in Latin America between 1955 and 1973.[11] But it is estimated that, without the contribution of public health technologies, life expectancy in developing countries in 1970 would have been about eight years lower than it actually was.[12]

To live longer is a benefit in itself and in this respect low-income populations are less "poor." However, there are several reasons for believing that most of the benefits of disease control programs which do not depend on individual response or living standards have now been reaped, and that further mortality declines will depend more on changes in individual behavior—changes that will be facilitated by increasing income and education and improving access to basic health services.

The first reason for believing this is that, in developing countries today, the diseases which kill are different from those of the now-developed countries at a similar stage in mortality decline. For example, mortality from diarrhea in developing countries is two to three times higher than it was in the West when their death rates were similar.[13] Diarrhea is a disease of the poor—in fact, primarily of poor children. It is

found along with malnutrition and is caused by lack of access to clean water, to simple health services, and to the basic education which might compensate for difficult living conditions.

Second, there are differences within developing countries in death rates by income level and other socioeconomic indicators which point to a link between poverty and high mortality. In Latin America, infant and child death rates are as much as five times higher among children whose mothers never went to school than they are among children of mothers with ten or more years of schooling.[14] Child mortality rates are lower in high-income households in Colombia and Brazil and generally higher in rural than in urban areas among children of parents with similar levels of education.[15]

Third, in countries like Sri Lanka, Cuba, Costa Rica, and Korea, where life expectancy is higher than might be expected judging from per capita income alone, income tends to be better distributed than in other developing countries, illiteracy is low, and health services are more widespread. The barrier that poverty, in its various guises, poses to mortality decline is less a factor in these countries.

Finally, a recent comparison of trends in life expectancy between developed and developing countries by demographer Davidson Gwatkin of the Overseas Development Council suggests that mortality decline is slowing down too soon in developing countries. In the now-developed countries, gains in life expectancy have slowed as the level of about 70 years has been reached. But up to a life expectancy of about 60 years, the increase in life expectancy was greater every year. In some developing countries and in some low-income regions within countries, by contrast, the annual gain in life expectancy is shrinking at levels that are still relatively low, for example, at 47 years for Africa and 58 for Asia in 1970-75.[16] Any such slowdown in mortality decline raises the question whether poverty is not posing a barrier to further progress.

Fertility change and poverty. A fertility decline relies almost entirely on a change in the behavior of individuals and thus, in contrast to mortality, falling birth rates have always been assumed to be closely associated with "development." But here what is actually meant by development is important. It was once assumed that reducing fertility in developing countries would first require urbanization, industrialization, a shift from family to factory production, and attainment of income levels close to those of the West. This view seemed confirmed by fertility declines in the 1960s that were largely confined to the industrializing economies of Taiwan, South Korea, Singapore, and Hong Kong. But fertility declines beginning in other developing countries in the late 1960s and spreading to more in the 1970s have moved ahead of this kind of development. Two explanations for this seem important.

First, and important for policy, is that these more recent fertility declines are related to a different kind of development, one defined in terms of the alleviation of poverty and improvement in living standards, rather than with the changes in economic structure conventionally associated with economic growth, such as higher average incomes and a shift to an industrial society. In studying 94 developing countries, Population Council researchers Parker Mauldin and Bernard Berelson found that the simple statistical correlation between the birth rate decline of 1965 to 1975 and GNP per person in 1970 was only .13, but between the decline and adult literacy it was .70, and between the decline and life expectancy it was .76.[17] Despite high average incomes, rapid industrialization, and rapid economic growth, birth rates fell less in Brazil and Venezuela between 1965 and 1975 than in Sri Lanka, Thailand, and Turkey where income gains and social services have been more widely distributed.

Second, and also critical for policy, is that the technology of family limitation has greatly improved. Modern contraceptives have lowered the psychic costs of limiting fertility, and many governments have taken steps to subsidize the money costs of modern contraceptives by establishing or supporting programs to deliver family planning services. Where family planning services are widespread and low in cost, fertility has declined more rapidly than social and economic progress alone would predict. Some examples are Tunisia, Thailand, Colombia, Costa Rica, and, more recently, Indonesia.[18]

The fertility declines that have begun in developing countries are generally occurring at lower average levels of income and at a faster pace than earlier declines. Countries such as England, Austria, Italy, and the Netherlands where fertility started downward toward the end of the 19th century took about 50 years to go from birth rates of 35 to 20 per 1,000 population, averaging a decline of about .3 points per year. Countries like Chile and Taiwan which had birth rates of about 35 per 1,000 in 1965 have averaged as much as one point a year off their birth rates since then. Other countries, including Colombia, Costa Rica, and Malaysia, with rates above 40 in 1965, have experienced declines of about one point a year once their birth rates fell below 35. One explanation for this accelerated fertility decline is probably the speedup in the pace of other changes that generally lead to smaller desired family sizes—increased education and urbanization, income growth, and, until recently, mortality decline. But recent cross-country studies suggest that, given smaller desired family sizes, easier access to the means of fertility reduction has also

UNICEF photo by Supachai na Pombejr

The rapid post-World War II mortality decline in developing countries due to public health campaigns, as here in Malaysia, is now slowing. Further mortality declines are likely to depend more on changes in individual behavior dependent on improved living standards.

mattered.[19]

Although the technology to reduce fertility has been increasingly available in many developing countries, including many where birth rates have fallen rapidly, it is not as easy to deliver and is not as widely used as the postwar public health technologies for controlling deaths. Using the means to restrict fertility requires a conscious choice by individuals, and this alone could explain the delay in worldwide acceptance of contraceptives compared to the widespread adoption of public health technologies not dependent on individual application.

Future fertility declines thus seem to depend both on general improvements in living standards and on diffusion of the technology of modern contraception to broader segments of the population. The World Bank's projections of future population growth assume continuation of current rates of social and economic progress, including the spread of education and health services and of family planning, as well as gradual per capita income growth. Obviously, if these rates change, upward or downward, so could the rates of fertility and mortality. Consider the case of countries where fertility rates are substantially higher among the poor than among the better off, and where the poor constitute a large enough portion of the population so that their high fertility pushes the countrywide average significantly upward. This is true of several Latin American countries, notably Brazil and Mexico. Here the current fertility decline will continue if it spreads to the less privileged groups whose birth rates are now high. The declines could perhaps exceed the average fertility declines projected if special efforts were made to improve services received by the poor. However, a decline following this pattern depends crucially on improvement of living standards among today's poor. Whether this will happen depends on a host of economic and political factors beyond the scope of this *Bulletin*.

Effects of Rapid Population Growth on Poverty

Effects at the national level

The 18th and 19th century economic growth of Western Europe and North America was accompanied by the first sustained increase of population the world had ever known. A growing population is not automatically bad for economic growth. It can contribute to economic growth by stimulating demand, encouraging technological innovation, and reducing investments risks; by allowing for constant improvement of the labor force with increasingly educated workers; and by permitting economies of scale in transportation and communications and in production for large markets.[20]

But annual population growth in industrializing Europe seldom went above 1 percent, compared to the rates of 2 to 3 percent which most developing countries averaged in the first decades after World War II. Besides doubling their total numbers in 20 to 35 years, these growth rates have led to a concentration of developing countries' populations in the young, nonproductive ages. This situation hampers production and burdens national budgets with larger "consumption" costs for social overhead needs like schools. In addition, except for a few developing countries, large-scale outmigration has not been possible to ease population pressures as it was for 19th century Europe, from which millions left for the New World. And for today's developing countries, the burden of this more rapid population growth is compounded by the competition they face from already-modernized economies in the sales of their products on which their economic growth depends. Also, the heightened social expectations of today and the need to

Table 1. Growth Rate of Population, GNP, and GNP per Capita: Selected Countries, 1970-1978

Countries	GNP per capita[a] US$ 1978	Average annual population growth, percent 1970-78	Average annual total GNP growth, percent 1970-78	Average annual GNP per capita growth, percent 1970-78
Low-income countries				
Bangladesh	90	2.8	3.0	0.2
India	180	2.0	3.6	1.6
Sri Lanka	190	1.7	3.6	1.9
Zaire	210	2.7	0.4	-2.2
Pakistan	230	2.9	4.4	1.5
Kenya	330	3.4	6.0	2.5
Indonesia	360	1.8	7.2	5.3
Middle-income countries				
Egypt	390	2.2	8.6	6.3
Thailand	490	2.8	7.4	4.5
Philippines	510	2.7	6.5	3.7
Nigeria	560	2.5	7.0	4.4
Morocco	670	2.9	6.9	3.9
Peru	740	2.7	3.1	0.3
Colombia	850	2.3	6.0	3.6
South Korea	1,160	2.0	10.2	8.1
Turkey	1,200	2.5	6.7	4.1
Mexico	1,290	3.3	4.6	1.3
Taiwan	1,400	2.1	9.1	7.0
Costa Rica	1,540	2.5	5.9	3.3
Brazil	1,570	2.9	9.1	6.0
Venezuela	2,910	3.4	6.6	3.1
Industrialized countries				
United Kingdom	5,030	0.1	2.0	1.9
Japan	7,280	1.2	9.1	7.8
France	8,260	0.6	3.7	3.1
West Germany	9,580	0.1	2.5	2.4
United States	9,590	0.8	3.1	2.3
Sweden	10,210	0.3	1.4	1.1

Sources: GNP per capita 1978: World Bank, *World Development Report, 1980* (Washington, D.C.: 1980) Table 1; Population growth rate 1970-78: *ibid*, Table 17 (with updating by World Bank staff); Total GNP and GNP per capita growth rate 1970-78: *1980 World Bank Atlas* (Washington, D.C.: 1980).

[a] See Figure 1 for definition of GNP per capita.

compete in a world of rapidly changing technology means they must invest more in the health and education of each new generation than national governments did in the past.

There are a few poor countries where high population density, combined with a large proportion of uneducated people and a scarcity of "physical capital" (like roads and irrigation systems) in agricul-

tural areas, is likely to be a cause of continuing poverty. To these we turn below. But for most developing countries the population problem is one of rapid growth *rates* rather than density. Rapid growth rates are a problem because they may slow per capita economic growth and because, given certain conditions, they may exacerbate income inequalities and worsen the situation of the poor.

Per capita GNP. Differences in population growth rates have, at least in a crude arithmetical sense, assured continuing international inequality in per capita income since 1970, as Table 1 shows. Between 1970 and 1978, the total gross national product (GNP) generally grew at 2 to 4 percent per year in the poorest countries (Bangladesh, India, Pakistan, and most countries of Africa). This was barely more than the average annual population growth rate in these countries so that increases in income per person (GNP per capita growth) were minimal. These countries suffered from a combination of slow economic growth and rapid population growth. In most countries which the World Bank classifies as "middle-income" (for example, Egypt, South Korea, Thailand, Mexico, and Brazil), overall economic growth rates were much higher—between 5 and 10 percent—so that even with rapid population growth, per capita income grew by 3 to 8 percent a year (except in Peru and Mexico, of the countries shown here). In industrialized, or developed countries, growth in total GNP was quite sluggish in this period, exceeding 4 percent only in Japan. However, their low population growth of 1 percent a year and less meant that per capita income gains were generally almost as large as in the high-growth, middle-income countries. Also, of course, their gains came on top of much higher initial per capita incomes, assuring a continuing huge disparity in per capita income between these countries and the rest of the world (except for a few oil-rich, developing countries like Kuwait, with a GNP per capita of $14,890 in 1978, Saudi Arabia, at $7,690 in that year, and Libya, with $6,971).

These group averages demonstrate at the same time that the relation between economic growth and population growth is not simple. The experience of the middle-income countries shows that the two can go hand in hand; rapid population growth has been accompanied by substantial gains in per capita income. However, with slower increases in the number of people, per capita incomes would probably be higher, even though the growth in total GNP might slow over the long run with fewer people being added to the labor force. Also incomes of the poor within countries might have been higher with slower population growth, a consideration which is particularly relevant for the middle-income countries of Latin America.

The idea that rapid population growth slows per capita income growth and exacerbates inequality rests chiefly on two assumptions. First, it is assumed that with rapid increases in the number of workers, each worker produces less in relation to the land and capital each has to work with; thus wages are reduced relative to profits. Second, as the number of dependent children per worker increases, it is assumed that a country's total savings will go down, restricting the money available for investments in education and in physical capital like housing, roads, and factories. Whether these assumptions are valid, however, depends on other assumptions, many of which can mitigate the effects of rapid population growth. Among these are how fast a country's "capital stock" grows; whether or not uneducated workers can be substituted easily for educated workers or labor can be substituted for land and capital; and the extent to which technological change is responsive to the relative scarcity of physical capital and the abundance of uneducated labor in poor countries, and encourages techniques which rely heavily

Table 2. Population Age Structure and Birth Rates: Selected Countries, About 1980

Countries	Percent of total population aged				Crude birth rate[a]
	0-4	5-14	15-64	65 and over	
Low-fertility countries					
Japan	7.7	15.9	67.8	8.6	15
United States	7.4	15.6	66.1	10.9	16
Sweden	6.1	13.7	64.3	15.9	11
Declining-fertility countries					
South Korea	11.5	22.8	61.7	3.9	23
Colombia	13.3	22.8	60.6	3.3	29
High-fertility countries					
Mexico	17.4	27.7	51.4	3.4	37
Nigeria	19.7	27.8	50.1	2.4	50

Sources: Population age structure: 1980 World Bank population projections; Crude birth rate: Population Reference Bureau, *1980 World Population Data Sheet* (Washington, D.C.: 1980).

[a]Annual births per 1,000 population. Data are for 1978.

on unskilled labor. Because of these complicating factors, it is difficult to isolate the effect of population growth. Economic-demographic models of the process must invariably make some simplifying assumptions and their results speak too often only to those already converted—either to the relevance or the irrelevance of rapid population growth.[21]

For this reason, consequences of rapid population growth for the overall economy in poor countries are still best considered in terms of straightforward description of demographic structure and trends. We begin with age structure and then turn to trends in the growth of different age groups, pointing out the significance of these trends in light of theories that link population to economic growth and equality. Then we consider the effect of population growth on food availability.

Age structure. As a result of high fertility, developing countries have much more youthful populations than developed countries and consequently higher dependency burdens. Table 2 shows current differences in population age structure among selected countries grouped by current crude birth rates. The high-fertility countries have about 45 percent of their populations under the age of 15, the low-fertility countries between 20 and 25 percent. In the United States there are two persons of working age (15 to 64) for every one who is too young or old to work (under 15 or 65 and over). In Mexico and Nigeria there is only one. All other things equal (but of course they never are), if per-worker income were identical in Mexico and the U.S., per capita income would be about 30 percent higher in the U.S.

On the face of it, it would seem that the higher "dependency ratios" of developing countries must reduce the amount of available savings in those countries. There is surprisingly little hard evidence for this, however.[22] The assumption that a household's savings are reduced as children increase the proportion of income "consumed" by food, clothing, education, and health care fails to take into account the possibility that parents save *because* of children—either to invest in their education or to accumulate physical wealth to pass on

to them. Furthermore, major sources of savings in today's developing countries are not likely to be private households but foreign and domestic corporations, small businesses, and the government. Governments can impose a high savings rate regardless of dependency burdens through taxation and credit policies.

Increases in school-age population. Although the impact of rapid population growth on the *supply* of savings is unclear, its impact on the *demand* for savings as a source for investment in "human resources" is not. One obvious effect of rapid population growth is rapid increases in the size of the school-age and working-age populations, with resultant pressures on school systems and labor markets. Figures 4 and 5 depict the past and projected growth of these two age groups in four countries: Korea, where fertility began tc decline in the mid-1960s; Colombia, where the decline began in the late 1960s; Mexico, whose high birth rate has begun dropping only in the past few years; and Nigeria, where the rate is still a very high 50 births per 1,000 population.

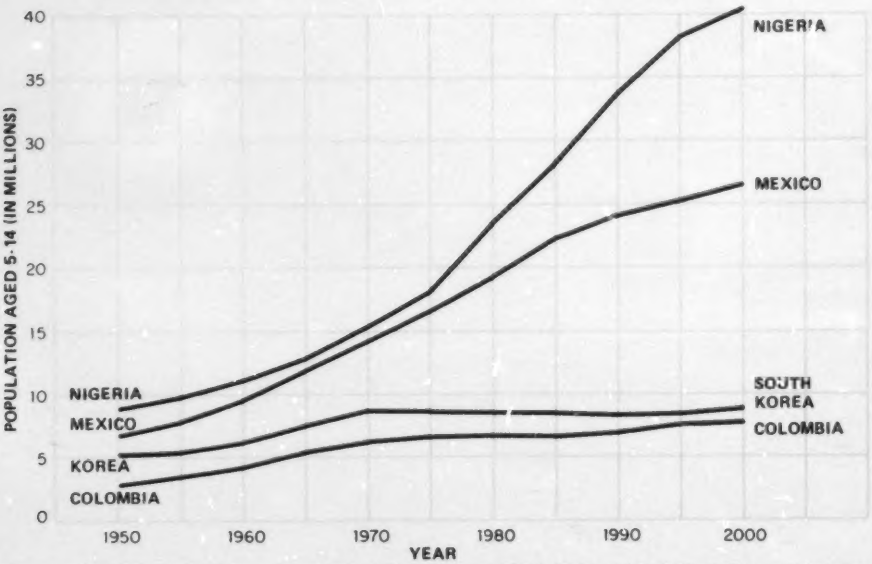
Between 1950 and 1970, the population of primary school age (5 to 14) grew at more than 3 percent and sometimes more than 4 percent per year in most developing countries. In most Latin American countries, the group more than doubled in size in those 20 years. In Nigeria, where infant and child mortality was higher, the increase was 70 percent, from under 9 million to more than 15 million. Even in Korea, where fertility began to fall in the 1960s, the numbers went up about 66 percent, from 5.3 to 8.8 million, reflecting high earlier fertility rates.

Most countries, developed and developing, spend about 1.7 percent of their GNP on primary education. But in poor countries that spending must be distributed among more potential schoolchildren. In 1980, about 25 percent of people in a typical developing country are of primary school age, compared to 15 percent in developed countries. Spending per child in less developed countries is much lower both because of lower GNP per capita and because for a given amount of total spending a typical developing country can support its school-age population only half as well, since it has almost twice as high a proportion of its population in that age group. More children of school age means more educational expenditures, or smaller educational inputs per enrolled child, or lower enrollment of eligible children, or some combination of all three.

One of the earliest economic effects of a fertility decline is an easing of pressures on education budgets as the proportions of school-age children go down. In Colombia, the fertility decline beginning in the late 1960s meant that numbers of school-age children, after doubling between 1950 and 1970, increased only slightly in the 1970s (Figure 4), and fell as a proportion of the total population. In Korea, with lower fertility, the proportion of the school-age population has shrunk even more. These countries have had the option of increasing the proportion of eligible children in school or spending more per child. This probably has reduced inequality and improved the chances of poor children to be enrolled. Children of the poor are likely to have had the lowest enrollment rates in the past and, when enrolled, were in the poorest quality schools.

What of the future? In Nigeria the birth rate will begin to decline slowly only after 1985, according to World Bank projections, and the number of school-age children will almost double in the next 20 years, as seen in Figure 4. In Mexico, by contrast, the fertility decline which started in the 1970s will slow annual growth for the school-age group from 3 to 1 percent and its size will increase by about 60 percent. And in Colombia, with a now well-established fertility decline, the school-age population will stabilize over the next two decades, except for a slight bulge after 1985 as children born to the large co-

Figure 4. Past and Projected Growth of School-Age Population: Colombia, South Korea, Mexico, Nigeria



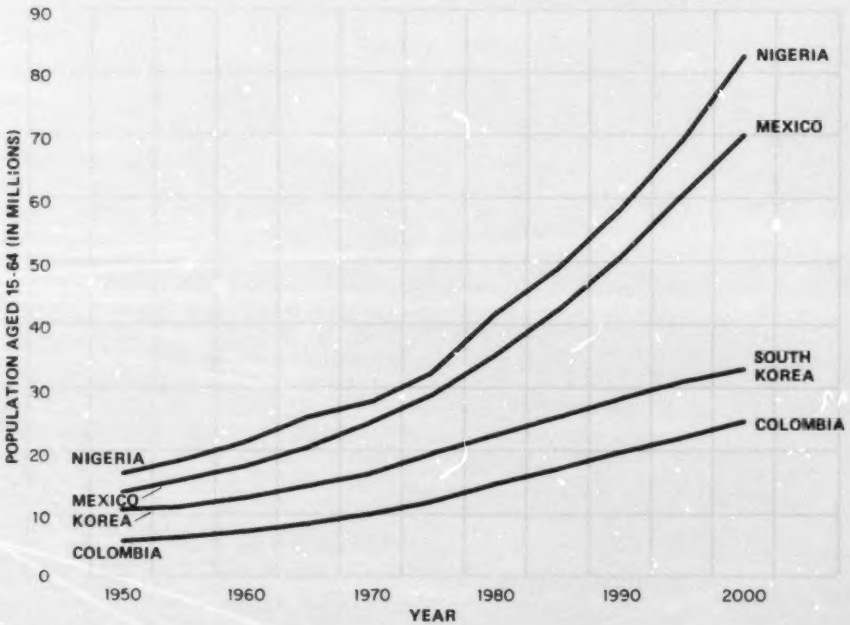
Sources: 1950-1970: United Nations Department of Economics and Social Affairs, *Selected World Demographic Indicators by Countries, 1950-2000*, August 1979; 1975-2000: World Bank population projections, 1980.

horts of the 1960s pass through school. As a result, Mexico and Colombia's dependency burdens will ease slightly. If per capita income growth is sustained and the same proportion of GNP is allocated to primary schooling, they should be able to extend education to a much greater proportion of poor children than hitherto possible.

Increases in working-age population. Besides high ratios of dependent children, developing countries are also burdened with the addition every year of many new workers as the large cohorts of children become old enough to work. In the past 25 years, the population of working age (15 to 64) has doubled in most developing countries, compared to a 45 percent increase in the United States, for example. Rapid labor force growth does not *necessarily* lead to unemployment and poverty if, as noted, the capital stock also grows and is efficiently allocated; if urban production can be geared to use more workers; and if irrigation, fertilizer, and other inputs are adopted in agricultural areas to permit more labor-intensive use of land. But these steps do require capital investments—and the more rapid the growth of the labor force, the greater the required investment and the greater the demand for alternative uses of available capital.

Most countries, both developed and developing, invest between 10 and 25 percent of their annual gross income, or "gross domestic product" (GDP), in capital stock like roads, factories, and power plants that make it possible to create new jobs. The investment in relation to each additional worker each year is much higher in developed countries, however. This is because their

Figure 5. Past and Projected Growth of Working-Age Population: Colombia, South Korea, Mexico, Nigeria



Sources: See Figure 4.

GDP per capita is so much higher to begin with. For instance, the Philippines invested a high 30 percent of its GDP in 1978. But this translated into much less investment per head than the relatively low 19 percent of GDP invested by the U.S. in that year because the U.S. per capita GDP is over ten times that of the Philippines. Also, developed countries can invest more for each new member of the labor force because labor force growth rates are so much lower—between 1 and 1.5 percent a year compared to almost 3 percent in the Philippines. If Kenya, India, and Pakistan had concentrated all new investment on new entrants to their labor markets in 1975, there would have been less than $4,000 available per worker, compared to more than $100,000 each in France, Japan, and the U.S.[23] These figures are only illustrative, given varying definitions of the labor force, the fact that one year's investment ratio may not hold over the long run, and the problems with using conventional exchange rates for international comparisons. But they do indicate the problems poor countries face in investing enough to avoid condemning new members of rapidly growing work forces to low-productivity, low-wage jobs.

Figure 5 illustrates how high the demand for jobs for new workers is likely to be in high-fertility countries over the next two decades. In Nigeria, the high fertility of the 1960s and 1970s guarantees a doubling of the working-age population. The *actual* labor force—people who are working or looking for jobs—could grow even faster if more women, for example, begin looking for paid work. In Colombia and Korea, the working-age population will grow more slowly but will

still increase in numbers in Colombia from 15 to more than 25 million.

Rapid labor force growth also means that a large portion of all workers are young and inexperienced. Inexperienced workers are usually less productive. As a result, average productivity is lower in a youthful labor force. This holds down per capita income and reduces the resources available for new investments. In Mexico, typically for developing countries, 54 percent of all persons of working age (15 to 64) are under age 30. In Japan the figure is 32 percent and in the U.S. it is about 40 percent—which is rather high for a developed country and reflects the high U.S. birth rates of the 1950s.[24] The percentages of actual labor force participants would differ even more between developing and developed countries, since schooling lasts longer in developed countries and young people enter the work force later.

The job market takes time to adjust to changes in the supply of more and less experienced workers and those who join the labor force as members of relatively large cohorts are likely to command lower average wages as they compete with each other for the relatively scarce job openings for new workers. This has been true for the members of the baby boom generation now entering the U.S. labor force. Their wages are lower relative to older workers than wages for new workers were a decade or so ago.[25]

If much of the rapid labor force growth represents rapid increases in unskilled workers, wages for the unskilled are likely to fall relative to those for educated, skilled workers and young workers with little or no education will fare even worse. In the rapidly growing, middle-income countries of Latin America like Brazil, the principal cost of rapid population growth may not be low overall economic growth but, rather, the inequality stemming from the wage differential between unskilled and skilled workers.[26]

Recent fertility declines in developing countries will not immediately slow the growth of the total labor force, but will mean early declines in the proportions of young workers. In Colombia, for example, the proportion of 15- to 24-year-olds in the working-age population will drop from 37 to 29 percent between 1980 and 1990. This could reduce unemployment if economic growth keeps up, since young persons are the hardest to absorb into the labor force and have the highest rates of unemployment, and eventually it could put more pressure on wages. Also, average labor productivity is likely to go up as the proportion of inexperienced workers in the labor force goes down.

Population growth, population density, and food availability. The impact of population growth on food availability has been a serious concern since Malthus. Food production in developing countries as a whole grew faster than population between 1960 and 1975, at annual rates averaging 3 percent. In many countries, however, rising income has pushed demand beyond output and food imports have been increasingly necessary to fill the gap. And in some of the poorest countries, especially in sub-Saharan Africa, food production has not kept pace with population growth. A fall in per capita food production is not in itself a problem as long as production is increasing in other sectors and exports of other goods provide the foreign exchange for food imports. But this has not been the situation for most African countries where most of the labor force is still engaged in agriculture. And for any country, this type of adjustment requires that resources be increasingly allocated to non-agricultural investment. Yet these resources are reduced on a per capita basis by rapid population growth.

Since agricultural output requires labor, agricultural production and population increases are not independent of each other; we certainly cannot assume that, had population growth been only half as great, growth in food output per

World Bank photo by Yosef Hadar

Plowing in Nigeria. Food production has not kept pace with population growth in some of the poorest countries, especially in sub-Saharan Africa.

head would have been twice as large. It is also incorrect to attribute poor food-growing performance primarily to population pressures on land. Other factors are more important—distorted prices, scarce credit, inadequate roads, lack of irrigation, and poor extension services—particularly in Africa and Latin America where population densities are relatively low, but also in Asia where densities are much greater. For the world as a whole, the spectre of too little land to feed too many people can still be stayed by capital investment and exploitation of new agricultural technologies to increase yields. In short, continued population growth can be accommodated, but at some cost. Either agricultural yields or output per capita in other sectors must be raised.

Is growing food scarcity, partly due to rapid population growth, the cause of the widespread malnutrition in developing countries? Probably not. In the short run at least, income inequality is a much greater barrier to improving the nutrition of the poor than is rapid population growth per se. To illustrate: Assume that population growth declines enough to assure constant real food prices, even with rising demand caused by rising incomes. With prices constant, it is estimated that the poorest 20 percent of households in Cali, Colombia, would need 19 percent more income than they have to assure enough calories in their daily diet and 43 percent more income to assure an adequate amount of proteins.[27]

Are food scarcity and malnutrition due to too-high population density? Poverty is not necessarily related to population density, even density per unit of arable land. Where agriculture is highly capital- and labor-intensive, as in Denmark and Japan, high yields can support large populations. Densely populated but highly industrialized countries can trade industrial products for food, as do Hong Kong and Engiand. Indeed, thinly spread populations can mean higher costs for transportation, communications, and delivering services which may retard development; this is probably the case in Tanzania.

However, there are a number of countries and regions within countries where growing density may be a cause of continuing poverty because it is combined with low levels of capital investment in agriculture and the absence of any compensating industry. In 1975, the agricultural population per crop area in Egypt, Bangladesh, and probably China was twice that of Japan and five times that of the Netherlands. In Egypt, yields are already close to those in developed countries, there is no prospect of bringing new areas under cultivation, and food imports are already large. Rapid industrialization is the necessary outlet. In Bangladesh, yields are still well below those of Egypt, but to increase them will require large expenditures to control flooding and educate farmers. China's yields are above those of Bangladesh but below Egypt's and her population growth is much slower than that of either. Nevertheless, it has evidently been difficult for China to raise agricultural output much faster than population growth.

Effects at the family level: family size and child welfare

High fertility also has unfortunate effects at the family level. Most studies of the consequences of family size have been carried out in developed countries. But their implications are important for developing countries where there are more children per family and incomes are lower. Adverse effects of family size on children's welfare are probably greater in low-income families.

Studies in Europe, the U.S., and a few developing countries have shown that children from larger families tend to be shorter, less intelligent, and are even less likely to survive.[28] In studies which controlled for socioeconomic class, the negative effect of family size was greater in lower classes but prevailed within all classes. One explanation may be that high fertility is often (though not necessarily) associated with closely spaced pregnancies; the mother's health may suffer, and the results—low birth weight and early weaning—can then damage the child's health in the critical early years.

Coming from a large family can handicap children intellectually as well as physically. A child's capacity to learn is affected by the amount and quality of attention received from parents and other adults in the first few years and that is generally less in large families. U.S. studies show that women with large families put in no more time on child care; educated women succeed in spending more time with each child principally by having fewer children.[29] Of course, many children are not invariably a burden to parents and can even add to family income. But even where they do, it is possible that children themselves, if not their parents, would be better off with fewer siblings.

Children and family income. When large families must adjust to low incomes it is often children who are most deprived. It is they who have the most to gain from long-term family "investments" in child health and education. But studies consistently show that an increase in the number of children shifts family budgets, not surprisingly, toward short-term spending on food. And even increases in food spending may not be in proportion to additions to the family. In the Colombian town of Candelaria, for example, the likelihood of malnutrition in preschool children in low-income families was directly related to how many brothers and sisters they had.[30] Of course, this need not mean that it is large family size which causes malnutrition: low income may cause both high fertility and malnutrition. Either way, however, the result is that children from large, poor families are doubly disadvantaged.

Do poverty and large families go hand in hand? The answer depends on how household income is measured. In Ta-

World Bank photo by Tomas Sennett

A crowded bus in Bangladesh where population density, combined with low investment in agriculture and a lack of industry, contributes to continuing poverty.

Table 3. Relative Income per Child in Households Classified by Total Household Income and Household Income per Person: Colombia, Malaysia, Brazil, India

Countries	Total household income Quintile[a], poorest to richest				
	1	2	3	4	5
Colombia					
Percentage of children	17.4	19.6	23.7	20.8	18.5
Percentage of income	3.7	7.4	11.5	18.4	58.9
Average number of children	2.3	2.5	2.9	2.7	2.3
Relative income per child[b]	1.0	1.8	2.2	4.1	14.7
Malaysia					
Percentage of children	15.2	21.1	21.0	23.5	19.1
Percentage of income	4.2	8.2	12.7	20.4	54.4
Average number of children	1.9	2.7	2.6	2.9	2.4
Relative income per child[b]	1.0	1.4	2.2	3.2	10.3
Brazil					
Percentage of children	16.4	24.5	21.8	22.1	15.1
Percentage of income	2.7	6.9	10.7	19.4	60.3
Average number of children	1.9	2.6	2.4	2.4	1.7
Relative income per child[b]	1.0	1.7	3.0	5.4	24.7
Rural India					
Percentage of children	12.5	16.8	20.0	22.8	27.8
Percentage of income	5.0	8.9	13.9	23.0	49.2
Average number of children	1.7	2.3	2.7	3.1	3.9
Relative income per child[b]	1.0	1.3	1.7	2.5	4.4

Sources: World Bank, Population and Human Resources Division, computer runs. Colombia and Malaysia data are from 1974 household surveys. (Marcelo Selowsky, *Who Benefits from Government Expenditure? A Case Study of Colombia*, and Jacob Meerman, *Public Expenditure in Malaysia: Who Benefits and Why*, World Bank Research Publications, Oxford University Press, 1979). Brazil results are based on a sample of the 1970 census. Indian data are from a 1970-71 village household survey conducted by the National Council for Applied Economic Research, New Delhi.

ble 3, households are placed in five income groups from the poorest to the richest 20 percent, using data from surveys in Colombia, Malaysia, and India, and from the 1970 census for Brazil. At the left of the table, the classification is by total household income and here, except for rural India, average numbers of children are highest in the three middle-income groups. However, when the grouping is by household income per person, as on the right of the table, average numbers of children are highest in the poorest 20 percent of households, as might be expected, even though these poor households lose more children through death.

Income per person is a better measure for judging the welfare of children within the household since it reflects how many persons must share a household's income and thus gives a better idea of the resources available to meet children's needs. Although children may

Household income per person Quintile[a], poorest to richest				
1	2	3	4	5
31.7	25.5	18.7	14.0	10.1
3.6	7.4	11.0	18.3	60.3
4.0	3.1	2.4	1.8	1.3
1.0	2.6	5.2	11.7	52.7
29.4	23.2	21.3	15.9	10.2
4.6	7.9	12.0	19.3	56.2
3.6	3.0	2.7	2.0	1.3
1.0	2.2	3.5	7.7	34.5
31.0	30.7	16.7	13.9	7.6
2.0	6.3	9.1	18.6	64.0
3.7	3.0	2.0	1.5	0.9
1.0	3.0	8.3	20.7	129.0
24.5	20.9	19.9	19.8	14.8
6.6	10.5	14.7	21.5	46.8
3.3	2.9	2.7	2.7	2.1
1.0	1.8	2.7	4.0	11.7

[a]Each quintile contains 20 percent of households.
[b]Ratio of income per child to that in quintile 1. See text for further explanation.

"need" less food than adults, they do increase a family's overall needs, and they usually "need" more than adults in health care and schooling. Indeed, children's school enrollment rates in sample data from Brazil show a closer connection with household per capita income than with the household's total income.[31]

The bottom row of each section in Table 3 shows "relative income per child." This index relates the average income per child in each group (the total income of all households in that group divided by the total number of children in the group) to the average for children in the poorest group of households. Even with households classified by total income (left panel), it is clear that children in the richest 20 percent of households are much better off; the ratio of their per-child income to that of children in the poorest households ranges from 4.4 in rural India to 24.7 in Brazil. With households classified by household income per person (right panel), the ratio ranges from 11.7 in rural India to 129 in Brazil. For the 7.6 percent of Brazilian children in the richest 20 percent of households, there is 129 times more income available than there is for the 31 percent of children in the poorest 20 percent of households.

For Brazil, the data by income per person (right panel, Table 3) also show that 60 percent of all children live in the poorest 40 percent of households (top row of the section) who between them have less than 10 percent of total income (second row). In fact, the data for both Brazil and Colombia suggest that the link between large families and scarce income for "investment" in children is strongest in Latin America, where the difference in average numbers of children between the richest and poorest households is greatest. However, even in Malaysia, 53 percent of children live in the poorest 40 percent of households and these households receive less than 13 percent of total income.[32]

Clearly a large proportion of children in developing countries grow up in poor households. This poses a special challenge to efforts aimed at developing human resources by increasing the productivity and incomes of the poor through better education and health. A disproportionate share of poor children will come from the large families that are least able to respond to increased educational opportunities and health

services. In Colombia and Malaysia in 1974, government subsidies for education and health were equal for all households.[33] However, average numbers of children were smaller in the richest 20 percent of households than in the poorest 20 percent—1.3 compared to 4.0 in Colombia and 1.3 versus 3.6 in Malaysia (Table 3, right panel). Therefore, these subsidies were not equal for children and worked out to twice as much for the richest fifth of households as for the poorest in both countries. Evidence from urban areas in Colombia also shows that parents themselves, of all income and education levels, spend less on each child's education when there are many of them.[34] Thus, children from large families receive less from both public and private spending on education.

In short, numerous children per family compound the problem of low income by reducing the resources put into each child's education and, probably, into nutrition, health care, and other basic needs. Poorly nourished children are likely to have trouble with schooling later on. And children who receive less education are likely to have many children themselves. From one generation to the next, large family size, low investments in children, and inequality in incomes and skills are bound together in a way that helps perpetuate poverty.

Effects of Poverty on Fertility

We now turn to the other side of the picture. To what extent do the socioeconomic characteristics of poverty—low income, lack of education, and poor health—*cause* high fertility? If these are changed, will high fertility, and hence rapid population growth rates, come down?

In reality, looking at the association between socioeconomic characteristics and fertility and between family planning services and fertility can give only a limited idea of how future changes we associate with development might affect future fertility. Virtually all such changes are highly interrelated—increasing literacy, urbanization, and incomes, rising life expectancy, and the ability of a government to launch and administer an effective family planning program—and it is difficult to sort out the impact of one from another. And yet, to make predictions and set policy, we still must ask which, if any, of such changes actually cause a shift to lower fertility; which are most powerful in affecting a shift; and which are most cost-effective, since reducing population growth rates is only one among several means of reducing poverty and accelerating overall development.

These questions are at the heart of studies of the determinants of fertility. By now there is agreement on at least a few socioeconomic factors which tend to motivate couples to want and have fewer children: more education for women, reductions in infant mortality, and greater equality in the distribution of income insofar as it raises the living standards of the poor.[35] These are discussed briefly below. However, there is no real consensus on which of these factors is necessary to a fertility decline. (Even reduced infant mortality has been challenged recently as a prerequisite, on the grounds that high unwanted fertility could cause high infant mortality, rather than the other way round.[36]) Nor is there agreement on the relative importance of one or another factor, in part because the relevant variables tend to be so closely interrelated.

The issue of the relative costs of influencing fertility is even more elusive. Most factors which appear to reduce fertility, like education for women and lower infant mortality, are policy objectives in their own right. Perhaps because of this there have been few studies of what the costs and benefits would be of promoting them explicitly as a means to lowering fertility. A few early studies did

speculate on the costs and benefits of averting a birth through a family planning program. But the estimates vary widely—from $1 to $400 on the cost side and from $100 to $900 on the benefit side.[37]

Few studies of the determinants of fertility within countries have included information on the supply of family planning services. (Two that did so in cross-country studies are discussed below.) This has made it difficult to settle for any individual country the dispute over the relative importance of the "demand" for family planning created by changing social and economic conditions versus the "supply" of family planning services, although by now most agree that both are important in lowering birth rates and that they are mutually reinforcing.

There are also few studies relating changes in socioeconomic conditions and fertility over time, partly because reliable data over time for various socioeconomic factors as well as fertility are rarely available for developing countries. If fertility declines in countries like Sri Lanka and Thailand have been more rapid than the pace of socioeconomic progress would suggest, then "cross-section" analyses at one point in time are probably no longer a good guide to how much fertility might be expected to fall in the future for given amounts of socioeconomic change.

Still, we do know that certain aspects of poverty contribute to high fertility. To begin this section, we review an economic theory of fertility which focuses on the family as the relevant decision-making unit and suggests why poor families are likely to want and have many children.

Household model of fertility demand

This model views children as a source of satisfaction, a "consumption" good for parents. But children are also "produced" in the household through inputs of parents' time and their purchases of housing, food, education, and health services for children. Children are also a form of investment—short-term if they work during childhold, long-term if they support parents in old age.[38]

According to the model, gains in income increase parents' "demand" for children. How then does it account for the fact that better-off families generally have fewer children? In two ways.

First, as parents' wage rates increase, alternative uses of time—earning money, developing and using skills, enjoying purchased goods—increase the "price" of children relative to other goods. As economic development raises wages (and thus the price of time), children—a time-intensive good—become literally more expensive. This most affects women as they are primarily responsible for bringing up children. As their opportunities for education and employment improve and their horizons expand, staying home to raise children "costs" women more and they are likely to begin choosing to have fewer of them.

Second, with increasing income and access to health and education (that is, a decline in the relative price of such services with development), parents opt to put more of their time and money into fewer, but healthier and better educated children. They are more likely to choose to invest in their children's education when they believe that future job opportunities will be governed less by class origin or family background than by education and associated skills. Since this tends to be a consequence of development, it helps to explain falling fertility over time. Children's education is not a good investment, however, if schools are too far away or of poor quality or children's work is important for the family's income.

For most poor families, children cost little and can even be a net benefit. Children of the poor spend less time in school and more time helping at home and working outside the home. Later, they can be expected to support their parents in old age. For parents, the

low current cost of raising children is a small price to pay for insurance against future uncertainties. Where mothers earn little for their work, the difference between children's and mothers' earnings may be small; work lost by the mother during a child's infancy may be easily recouped by the child later on. Finally, in poor countries much of women's traditional work—in agriculture, crafts, and petty retailing—can be combined with looking after children, so that women give up less by having children.

The link between household poverty and high fertility is further reinforced by high rates of infant and child mortality. In Colombia, for example, poor households experience twice the child mortality of rich households.[39] High infant mortality and high fertility are causally related in ways that are particularly true for poor families. In non-contracepting societies, an infant death which interrupts a mother's breastfeeding, so that ovulation is resumed sooner than it otherwise would be after a birth, can shorten the interval between that birth and the next conception. Parents whose children die may try to replace them; and where high mortality is common, parents may try to insure themselves against future child loss by having more children than they would ideally want. Conversely, high fertility contributes to high infant and child mortality: many births, especially if they are closely spaced, weaken both mothers and their babies and drain family resources that might be spent on improving their health.

Another reason for the relation between high fertility and household poverty is the fact that the poor tend to live in areas where modern and simple means of contraception are not easily available or, if available, are costly in relation to incomes of the poor. The "demand" theory of fertility does not imply that poor families have an unlimited demand for children. Only rarely today, as perhaps in sub-Saharan Africa,[40] are parents likely to want as many children as biology allows. Whether consciously or not, parents weigh the costs and benefits of having a certain number of children against the costs of avoiding children. For poor parents in rural areas, avoiding a pregnancy may mean sexual abstinence, illegal abortion, infanticide, or, at best, ineffective and difficult traditional contraception. The psychological costs of these may outweigh the low financial costs of having that additional child. Even in urban areas, if contraceptives must be bought from a private doctor, an additional child may cost a poor household less than family limitation.

World Bank photo by Edwin G. Huffman

A mother and child in Colombia where poor households experience twice the child mortality of rich households.

In considering the family-size desires of the poor, moreover, it is increasingly relevant to distinguish between medium-sized families of three children and large families of four or five or very large families of six or more. Poor parents may consider three children not enough but

wish to avoid having more than five—if the costs of avoiding children after the fifth are not too high. Small reductions in average family-size desires and actual numbers of children make a difference in how soon a country's birth rate begins to fall. Thailand and Colombia have had birth rate declines of 30 percent in the last 15 years, but fertility still averages four or more children per woman and desired family size is about four.[41] Four children is nearly double the replacement level of a little over two children per woman which eventually leads to zero population growth.

Influence of women and society. An extension of the household fertility demand model takes into account the obvious fact that husbands and wives may have different ideas about desirable numbers of children. In a recent survey in Nepal, for example, husbands and wives wanted the same number of children in only 78 cases out of 343 couples.[42] Women may very well want fewer children than their husbands or partners. The physical and usually the caretaking costs of children are greater for them. They may even bear the primary financial responsibility for children in societies where divorce and separation are frequent, where unions are highly informal as in Latin America, and in Africa where polygamous marriages mean one woman's children do not have a unique claim on their father's income and assets. Family planning programs which make female contraceptive methods like the pill and IUDs easily available at low cost can allow women to restrict their fertility without complete cooperation from husbands or sex partners. (Of course, in some circumstances women may want more children than men. In Bangladesh, for example, widowhood comes early and sons are virtually a woman's only safeguard against future economic misfortune.[43])

Another addition to the model considers how relatives, friends, the clan, the village, or even the national government (through propaganda or tax incentives) can affect individual couples' fertility behavior by affecting the social cost of unusual behavior. Village-level cooperation and persuasion are an important reason for Indonesia's success in family planning. Social pressure is even stronger in China where the right to have a child is assigned to couples in many communities and childbearing has become literally a community matter in the government's efforts to lower fertility.[44]

In short, the "fertility demand" model suggests that the important factors in reducing poor people's fertility are: lower infant mortality; more educational and work opportunities for women as alternatives to childbearing; an increase in the perceived costs of children for parents; increased availability of low-cost family planning services; and social backing for their use. Family planning services are discussed in the next section. The rest of this section looks at evidence on the other factors as well as on urbanization, income distribution, and age at marriage which are linked to these other factors and to fertility.

Some correlates of fertility

Infant mortality. A country's infant mortality rate largely determines its average life expectancy and, statistically, life expectancy is the best single "predictor" of countries' fertility rates. As we have seen, the correlation between life expectancy in 1970 and birth rate declines from 1965 to 1975 in the 94 developing countries studied by Mauldin and Berelson was a high .76. That is, the higher a country's life expectancy (and the lower its infant mortality), the greater the fertility decline. High infant mortality was found to be associated with high fertility in studies that looked at states in India and Brazil and households in Taiwan. In Colombia, no matter how many children they had, women who had lost a child through death were more likely to have another than other women. In Turkey and Egypt, couples who had lost a child

both had and expected more children than those who had not, even controlling for socioeconomic differences.[45]

On average, families who suffer infant and child mortality do not completedly replace all their lost children. That is, high rates of infant and child mortality could be expected to lead to lower average family sizes and thus lower population growth if this was the only influence on fertility rates. But it seldom is. Conversely, a decline in rates of infant and child mortality can be expected to increase average family sizes and thus raise population growth, at least in the short run. This was a major reason for the precipitous drop in overail death rates which caused the spurt in developing countries' population growth between 1950 and 1965 before birth rates also began to fall. How serious an issue is this for the future? Would new concentrated efforts to reduce infant mortality among the poor cause a new spurt in the developing world's population growth and burden poor families with even larger numbers of children? Not necessarily.

For one thing, in societies where high infant mortality encourages high fertility, reducing the chances of infant death is obviously a necessary step toward later reductions in fertility. In the long run, with lower child mortality, parents will not need extra births as insurance against future possible losses. In a healthier environment, they will want to invest more in the education of fewer children. In other words, reduced infant mortality not only helps parents to achieve their family-size desires with fewer births; it is likely to prompt them to reduce their desired family size as well.

And the "long run" need not be so long as in the past. For several reasons, the lag between lower infant mortality and lower family-size goals can be shorter than it was with the first round of mortality decline after World War II, or even eliminated. As we have noted, future death rate declines in developing countries will probably depend less on public health campaigns than on factors that reduce deaths by changing people's attitudes and behavior, such as improvements in education and income and access to regular health services. Many of these, like programs to educate mothers, are likely to reduce fertility as well as mortality. Recall also that in developing countries where fertility has begun to fall in the last decade, the decline has been very rapid, partly because family planning programs have been there to help translate new lower family-size goals more quickly into reductions in pregnancies. Assuming that reduced infant mortality brought about by special efforts to extend health services to the poor causes couples to want fewer children (even if no fewer *living* children), then providing family planning services as part of the improved health system will shorten the lag.

Another aspect of the relation between fertility and infant mortality is that in some circumstances high infant mortality may actually be a result of high fertility, just as the reverse is true. Infanticide has historically been used by desperate parents in many societies to eliminate unwanted births. Even today, higher mortality among small girls than boys in India, Ecuador, and Bangladesh and higher mortality among the second of closely spaced children in Ecuador suggests that high infant mortality may partly be a reaction to unwanted births by parents who have little access to alternative means of family limitation.[46] In societies where families struggle with both low income and inadequate health services, high fertility and high infant mortality are undoubtedly mutually reinforcing, and health and family planning services will be highly complementary.

Women's education, labor force participation, and status. Increased female education is one of the strongest and most consistent factors in reduced fertility. In the poorest countries, women with a few years of primary schooling have slightly higher fertility than women

World Bank photo by Ray Witlin

A classroom in Sri Lanka. Increased female education is one of the strongest and most consistent factors in reduced fertility.

with no education at all. This is probably due to the improvements in their health and ability to bear live children that come with the first income increases of the very poor, as mentioned below. Women who have completed primary school, however, virtually always have fewer children than women with no education, and numbers of children decline regularly as mothers' education increases above the primary school level.[47]

Studies also show that women's education makes more difference in reduced family size than men's does.[48] There are several plausible reasons for this. As noted, children "cost" women more than they do men and the more educated the woman the more opportunities she gives up if she chooses to stay home to raise children. Education delays marriage for women, either because marriage is put off while they are in school, or because educated women are more likely to work, or take more time to find suitable partners. Education probably increases women's willingness and ability to plan for the future and encourages activities outside the family. And educated women are more likely to know about and quickly adopt new methods of family limitation.

All of this adds up to a strong argument for righting the current imbalance in countries where boys are more likely to attend school and stay longer than girls. This may be so even given the costs and administrative difficulties involved in expanding enrollment in places like the Middle East and Pakistan, where social norms dictate separate schools for girls. Improving women's educational

opportunities is easily justified, anyway, on the grounds that better educated women will be more productive workers and better mothers.

The fact that a woman works outside the home seems to have a direct, independent effect on reduced fertility in developing countries only among women who work in high-wage, "modern sector" jobs. However, any increase in work opportunities for women should help reduce fertility indirectly by increasing parents' incentive to educate daughters and by making it less necessary for them to feel they must have a minimum number of sons for support in old age. Girls' school enrollment relative to that of boys is lowest in Middle Eastern countries where women's employment and other activities outside the home are extremely limited and preference for sons over daughters is the norm.

Besides encouraging and supporting better education and work opportunities for women, governments can lay the groundwork for improvements in the status of women by guaranteeing to them the right to hold and inherit property, the right to sue, and marriage and divorce rights, including the right to have a say in the choice of a husband. Once women gain more status in a society, individual women are likely to have more voice in family decisions regarding fertility.

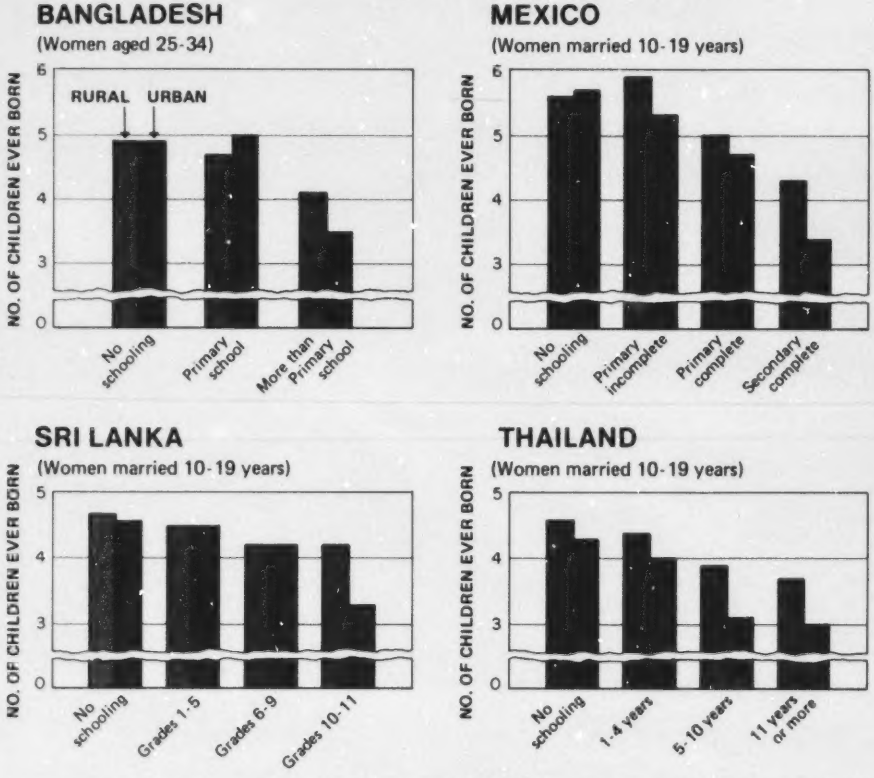
"Costs" of children. There is considerable debate on whether the children of poor parents end up giving or getting, that is, whether in addition to whatever emotional and psychological benefits children bring to all parents, poor parents also gain financially when they have an additional child. The authors of two studies in the poorest of settings—Bangladesh and Indonesia—concluded that children are a net financial benefit to parents. A study of one village in India and among less poor, rural inhabitants of Taiwan concluded that children end up costing parents.[49] The studies are not comparable; it may be only a coincidence that children were a financial benefit in the poorer settings.

Such studies require assumptions about how much a child's future earnings would be worth in today's dollars (or rupees or whatever) and how much an additional child is worth in terms of the help parents might need in old age or times of disability, and must take into account that a child may die and the "investment" in him be wiped out. In countries like India where sons might contribute more to parents' income than they cost but daughters not, some account must also be taken of the chances parents face with each pregnancy of *not* having a son, or having a son who dies. The benefits of good luck on both these counts must be sufficient to offset the costs of having a surviving daughter.[50]

How parents come out in such a complicated calculation is probably less important than the fact that so many parents live in conditions in which such a calculation is relevant. Even if parents do gain, it is likely that children in such settings lose, since the parents' overall gain often means that little has been spent on children's health and education. Where parents have many children because they need what little income children can bring in, the first step must be to relieve their desperate poverty and uncertainty about their own future. Only then would policies and programs to reduce fertility be reasonable.

In less desperate conditions, however, smaller family sizes could be encouraged much sooner by changes in the socioeconomic environment which increase parents' incentive to spend both more time and money on their children, thus raising the perceived costs of children. Improving the chances that children will survive to adulthood is one such change. Historians of the family now claim that mothers in preindustrial Europe, faced with high infant and child mortality (and much unwanted fertility), gave little time or attention to newborns.[51] A second change is increasing

Figure 6. Average Number of Children Ever Born to Ever-Married Women by Women's Education and Rural-Urban Residence: Bangladesh, Mexico, Sri Lanka, Thailand



Sources: Bangladesh: Ministry of Health and Population Control, *Bangladesh Fertility Survey 1975-1976*, World Fertility Survey First Report (Dacca: 1978); Mexico: Coordinacion General del Sistema Nacional de Informacion, *Encuesta Mexicana de Fertilidad, 1976*, World Fertility Survey First Report, Vol. 2 (Mexico City: 1979); Sri Lanka: Ministry of Plan Implementation, *World Fertility Survey, Sri Lanka, 1975*, First Report (Colombo: 1978); Thailand: National Statistical Office and Chulalongkorn University, *The Survey of Fertility in Thailand*, World Fertility Survey First Report, Vol. 2 (Bangkok: 1977).

the importance of education. In Nigeria and Taiwan, parents who hoped to educate their children expected and had fewer of them. In Colombia and the U.S., children with fewer brothers and sisters go further in school.[52] These findings suggest that increased accessibility to schooling would be accompanied by reduced fertility as parents see the merits of investing more in each child and reduce fertility in order to do so. And the future fertility of children now in school should also be reduced.

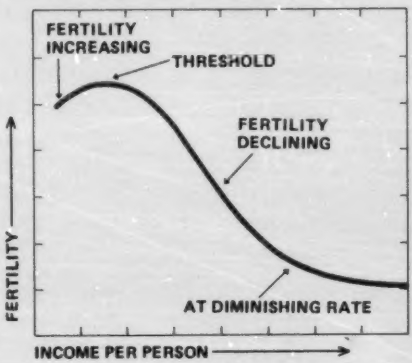
Urbanization. It is commonly assumed that children cost parents more than they contribute to family incomes in urban areas, while they can be a net benefit in rural areas where they probably work more. However, there is no real evidence that living in an urban area

in itself reduces fertility. Figure 6 shows data from recent surveys conducted in Bangladesh, Mexico, Sri Lanka, and Thailand as part of the World Fertility Survey on numbers of children ever born by mothers' education and by residence in rural or urban areas. In general, increased education reduces fertility more than urban residence does. Studies of the early 1970s in Egypt, Indonesia, and Nigeria all reported slightly *higher* fertility in urban areas, particularly among the least educated women. Another study in Thailand showed that only in one region was the level of urbanization in 1960 related significantly to a fall over the next ten years in the numbers of children that women had. In Latin America fertility rates are lower in urban than in rural areas, but much of this is due to urban dwellers' higher education and better access to family planning services.[53] Urban residence alone is certainly not enough to reduce fertility, and fertility declines in rural areas of Taiwan, Indonesia, Sri Lanka, and Colombia show that it is even not necessary.

In some countries, urban residence may be a prerequisite to other changes in a person's life which do lower fertility, such as increased education and better opportunities for children. But that these other changes can occur in a rural setting is suggested by the countries just mentioned. In short, it is the partial escape from poverty which lowers fertility. Whether it is cheaper to introduce these changes in urban areas and expect their benefits to cover more people as they migrate to towns, or go directly to rural areas, depends on local conditions.

Income distribution. Fertility does not fall regularly from the lowest to the highest incomes but follows a pattern more like that shown in Figure 7. Among the very poorest people, malnutrition and disease may impair women's ability to bear children, and increases in income could then increase their fertility, at least up to a point.[54] Beyond that

Figure 7. Relationship Between Fertility and Income per Person



"threshold," further increases in income are associated with falling fertility. The threshold is not high; the proportion of families below this line is small except in the poorest countries of South Asia and Africa.[55] Thus comparisons between countries generally show lower and lower fertility levels as income per person increases (see Figure 1, page 6).

Because most households in most countries fall to the right of the threshold, countries and regions in which poor households have a greater share of total income have lower overall fertility rates. Fertility has fallen more where the distribution of income has become more equitable (Costa Rica, Sri Lanka, Taiwan) than where it has not (India, Brazil, Puerto Rico).[56] A recent cross-country study using World Bank data showed that the share of total income going to the poorest 40 percent of households was as important as life expectancy and the percent of literate adults in "explaining" 1970 fertility rates.[57] In fact, income distribution, along with either literacy or life expectancy and controlling for per capita income, explained about 80 percent of country differences in fertility rates.

It is not clear from studies so far if the share of the poor in a country's total

income affects their fertility over and above the effect of the absolute level of their income, which clearly does matter—leading to reduced fertility once it gets past the threshold level. It may be that, with a smaller gap in income between rich and poor, the poor learn about and respond more rapidly to new information about contraception—information that is first available only to the privileged in a society. Or with a smaller gap, the poor may feel that they or at least their children have more chances to better their lot in life and this could encourage poor parents to reduce their family size in order to put more investment into fewer children.

As Figure 7 also shows, decreases in fertility for given increases in income are greater at *lower* incomes. That is, raising the income of the rich—both rich countries and rich groups within countries—reduces fertility far less than raising the incomes of the poor. Indeed, there is some evidence that increases in income at the very highest levels translate into higher fertility.[58] Less than 15 percent of global income growth between 1960 and 1973 went to countries with per capita incomes below $1,000 in 1973, countries that included about 75 percent of the world population in that year. The remaining 85 percent of income growth occurred in countries to the far right in Figure 7, where only 25 percent of the world population lived and where it was irrelevant to further fertility declines.[59]

Age at marriage. Since most childbearing in developing countries takes place within marriage, either formal or consensual, the recent rise in women's age at marriage in many developing countries has been a factor in the concurrent decline in birth rates. Delayed marriage helps lower the rate of population growth by lengthening the interval between generations, by shortening the period during which women are likely to have babies, and perhaps by giving women other interests beyond family and childbearing to take with them into married life.

The average age at marriage (corrected for the proportion of women who never marry) is now 22 in the middle-income countries of Latin America and in Taiwan, Malaysia, Singapore, and South Korea, although it is still less than 20, and sometimes much less, in many sub-Saharan African countries and in Nepal, India, Pakistan, and Bangladesh.

Although reduced birth rates can result from later marriage, later marriage in itself does not necessarily *cause* lower fertility. Women who marry later tend to be better educated and more interested in non-familial activities anyway, and plan fewer children for those reasons. In a recent study, age at marriage added nothing to the explanation of variations in country fertility rates that was not already explained by levels of life expectancy and adult literacy.[60] Later marriage itself is a direct cause of reduced fertility only if women marry later because of circumstances over which they have no control, such as a dearth of eligible partners due to war, too little money to marry early, or because of strong social sanctions against early marriage, as in China.

An increase in women's age at marriage is most closely associated with declining fertility in Asia. In the 1960s in South Korea, Taiwan, and West Malaysia, changes in the proportion of women married accounted for about half as much of the decline in birth rates as did changes in marital fertility, and were more important than marital fertility declines in Sri Lanka and the Philippines.[61] China has placed great stress on delaying marriage in its program to reduce population growth, but there are no data showing what the actual effect of this policy has been on the birth rate.

In Latin America, later marriage has been a less important ingredient of declining fertility. This is partly because average age at marriage (or consensual union) was already high compared with Asia and partly because much of the

fertility decline in such countries as Chile, Colombia, and Costa Rica has been among older women. Fertility is generally high and age at marriage low throughout Africa and the Middle East.

Age at marriage will matter less for fertility decline as safe and effective contraceptives become more widely available. Nevertheless, it will be particularly important for the next two decades because there will be more than one billion young people of marriageable age (roughly 15-29 years old) in the developing countries by 1990, twice as many as there were in 1960. If they marry young and reproduce early, rapid population growth will continue well into the 21st century even if the fertility of women once they are married falls sharply. Though efforts to raise people's age at marriage by persuasion and edict have not been particularly successful except perhaps for China, legislation is a way for governments to arouse social support for later marriage. And governments can link the idea of delaying marriage to educational programs, especially for women, which reduce fertility more directly as well as indirectly through their impact on age at marriage.

Family Planning Programs and the Poor

Lower fertility is not an end in itself, but one among several ways of improving human welfare. Most governments now recognize the social and economic costs of rapid population growth. Some 35 developing countries, with 79 percent of the developing world's people, currently have an official policy to reduce population growth. An additional 14 percent of the developing world's population lives in countries where there is official support of family planning programs as a contribution to health and as a basic right.[62]

A policy to reduce population growth need not be confined to support of family planning programs. Some countries now consider the potential demographic impact of other development programs, recognizing that desired family size can be reduced by increased education and by basic health services which reduce infant mortality. A few countries—most notably Singapore—have used tax and housing policies to discourage large families. Payments for sterilization have been used in Sri Lanka and in India (where the system was abused for a time). China, which for several years has emphasized that later marriage and small families are patriotic, recently announced bonuses and preferences for one-child families, and tax and housing penalties for couples who in the future have more than two children.

In general, however, promoting family planning is the most widely accepted and practical aspect of population policy. How effective have family planning programs been in reducing fertility?

Impact on fertility

Measuring the possible role of a family planning program in a developing country's fertility decline requires systematically eliminating other possible causes of the decline, such as increases in income, education, and life expectancy during the same period. Only a few studies have done this adequately so far. Studies comparing fertility differences among countries, regions, or households at one point in time generally do control for socioeconomic differences among households, for instance, but lack data on differences in the availability of family planning services to those households. Unfortunately, data on the *use* of family planning cannot substitute for data on its availability (though the two are clearly related), since use is linked with couples' fertility goals and does not indicate what difference family planning services would make to people who now have no

access to them.

With these analytical difficulties, it is not surprising that policymakers and planners still cannot completely agree on the relative importance to a fertility decline of the supply of family planning services versus the "demand" factors—increasing education, lower infant mortality, and the like. By now, however, most agree that a practical policy to reduce birth rates requires both socioeconomic change and provision of family planning services, with emphasis on providing services where they would be most cost-effective, that is, where social and economic conditions have improved enough to suggest that a demand for family planning exists.

The logic of this dual approach is supported by findings from two recent cross-country analyses of fertility decline in developing countries. Both used the birth rate data that are now available for most developing countries for more than one point in time and an index of governments' family planning "effort" as of about 1972 which was developed by demographers Robert Lapham and Parker Mauldin. The index is based on countries' performance on 15 programmatic criteria, such as the availability of contraceptives, both through government programs and commercially, inclusion of fertility reduction in official planning policy, adequacy of the family planning administrative structure, use of mass media and fieldworkers, and "favorable public statements by political leaders." Countries were scored 2 (yes), 1 (qualified yes), or 0 (no) on each point, giving a total score of 0 to 30 for each country.[63]

Using this index along with indicators of socioeconomic development such as literacy, life expectancy, and GNP per capita as of about 1970, Mauldin and Berelson found that birth rates declined most (29-40 percent) between 1965 and 1975 in countries like Singapore, Korea, and Costa Rica where socioeconomic development was relatively advanced and family planning programs

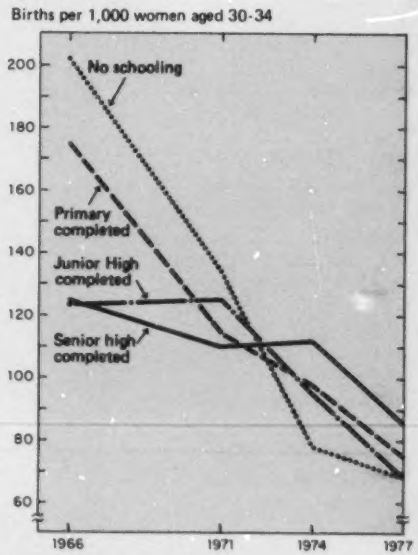
World Bank photo by Kay Chernush

A family planning fieldworker visits in the slums of Dacca, Bangladesh.

were also strong by the early 1970s. There was a modest birth rate decline (10-16 percent) where development levels were relatively high but family planning effort was weak, as in Brazil and Turkey, for example. There was also a modest decline where development levels were low but family planning effort was moderately strong, as in India and Indonesia. (Indonesia's family planning program, now one of the world's strongest, had been operating only two years by 1972, the reference year for the family planning effort index.) Similar results are reported by David Wheeler in a comparable analysis using measurements of socioeconomic change from 1970 to 1977 rather than levels at one point during the period.[64]

The cross-country studies are complemented by several country examples of apparent family planning success, of which the most cited are China and Indonesia. Per capita income is low and the population still overwhelmingly rural in both countries, but a concerted effort has been made to bring family planning services to the mass of people in the villages. In China, the official birth rate estimate for the end of 1978, based on birth registrations, is 18 per 1,000 population.[65] This is down from 40 in the 1960s. Even assuming some underregistration of births,[66] China's birth rate is probably not above 25 per 1,000 population, which is well below current rates in South Asia, Africa, and most of Latin America. Up to 70 percent of Chinese couples of childbearing age are estimated to be using modern contraceptives.[67] The government clearly believes its family planning program effort is critical to its birth reduction campaign. Indonesia's birth rate is currently estimated at 35 to 37 per 1,000 population, which is also a notable drop from an estimated 47 in 1960.[68] In Java and Bali, the two most populous islands of the country, the percentage of married women of reproductive age currently using modern contraceptives more than doubled in the two years from the end

Figure 8. Fertility Trends by Women's Education: Taiwan, 1966-1977



Sources: Ronald Freedman, et al., "Trends in Fertility and in the Effects of Education on Fertility in Taiwan, 1961-1974," *Studies in Family Planning*, Vol. 8, No. 1 (January 1977) Table 8; and Republic of China, Ministry of Interior, *1977 Taiwan-Fukien Demographic Fact Book* (Taipei, Taiwan: December 1978).

of 1974 to 1976/77 (10.5 to 24.2 percent) and nearly doubled again to 42.0 percent in 1979/80.[69]

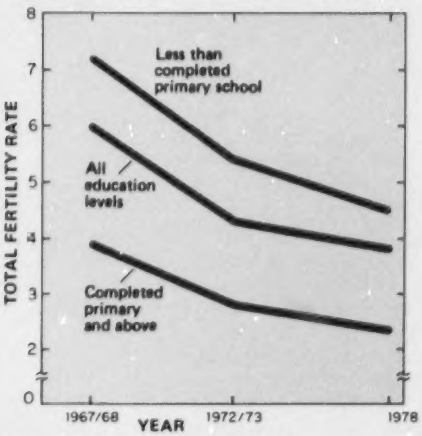
Other developing countries have also had remarkable increases in contraceptive use and rapid fertility declines, including among women with little or no education, many of whom are probably "poor" by our definition. In Taiwan after a family planning program was launched, the proportion of illiterate married women who had ever used contraception rose from 19 to 78 percent between 1965 and 1976.[70] Fertility dropped by half between 1966 and 1977, and the decline was steepest among the least educated women, as shown in Figure 8. In Colombia a strong

private family planning program was under way by the late 1960s and the government began supporting family planning in 1970. As Figure 9 shows, the drop in fertility for women with little schooling has paralleled that of better educated women.

We cannot assume that family planning availability has made the entire difference in these countries. In China, the government has exerted considerable social and direct economic pressures to reduce fertility; family planning services have provided couples the means to do so. In Taiwan and Colombia, the household income of women with little education was probably increasing in the 1960s and 1970s, and this probably encouraged the use of contraception to restrict births. And, of course, there are other low-income countries in which family planning programs have *not* been effective in reducing fertility, for example, Pakistan, Bangladesh, Kenya, and Ghana. Weak government support of the programs may be part of the reason. But lack of demand for birth control methods has probably also mattered.

Still, China, Indonesia, Taiwan, and Colombia suggest that the social and economic conditions in which family planning programs can be effective may not be so stringent as once believed. Even among the "poor" by our definition, reducing the costs of avoiding pregnancy could make some difference in their fertility. And the impact should be greater if family planning services are accompanied by programs to reduce mortality, improve education, and increase the poor's share of total income.

Figure 9. Fertility Trends by Women's Education: Colombia, 1967-68 to 1978



Sources: Joseph E. Potter, Myriam Ordonez G., and Anthony R. Measham, "The Rapid Decline in Colombian Fertility," *Population and Development Review*, Vol. 2, No. 3-4 (September/December 1976) pp. 511 and 521; 1978: Data from 1978 Contraceptive Prevalence Survey supplied by Westinghouse Health Systems.

Family planning as a service

Preventing births imposes costs. Modern contraceptives usually cost money, and even if free they cost time. They may be bothersome to use, clash with religious principles, and be frowned upon by kin and friends. But without modern contraceptives, the costs of preventing children are much higher—sexual abstinence, withdrawal, abortion, infanticide.

Other things being equal, then, making modern contraceptives available should cause people to have fewer children, except in the rare cases where many couples have fewer children than they want because of impaired fecundity (in Nepal, possibly, and parts of Africa). Moreover, family planning improves people's well-being even if it does not reduce fertility. With modern contraceptives, couples incur lower psychic costs to achieve any given number of children. The arrival of children can be timed more easily, often with beneficial effects on children's and mothers' health, and sexual activity can be enjoyed without fear of pregnancy.

But as with education and general health services, the poor are usually the

Table 4. Percentages of Women Who Want No More Children and Are Using Modern Contraceptives, by Residence, Education, and Strength of Country Family Planning Program: 11 Developing Countries

Strength of family planning program, 1972,[a] and country (year of survey)	Place of residence			Level of education		
	Rural	Urban	Ratio of rural to urban	No education	Six years or more	Ratio of uneducated to educated (six years or more)
Strong program						
South Korea (1974)	37%	40%	.92	35%	37%	.95
Costa Rica (1976)	69	73	.95	59	75	.79
Moderate program						
Malaysia (1974)	26	37	.70	23	40	.58
Colombia (1976)	25	49	.51	21	57	.37
Indonesia (1976)	47	42	1.12	42	58	.72
Sri Lanka (1975)	30	41	.73	26	40	.65
Thailand (1977)	49	71	.69	43	65	.66
Weak program						
Pakistan (1975)	5	15	.33	7	25	.28
Kenya (1978)	15	29	.52	12	33	.36
Nepal (1976)	8	34	.24	8	71	.11
Bangladesh (1976)	7	25	.28	7	28	.25

Sources: Cross-tabulations of World Fertility Survey data provided by WFS staff, London.

[a]For description of index of "family planning effort," see text, page 35.

Note: For slight variations in definitions of "rural" and "urban" and "six years of education or more," see Nancy Birdsall, *Population and Poverty in the Developing World*, World Bank Staff Working Paper No. 404 (Washington, D.C.: 1980) Tables IV-2 and IV-3.

least likely to benefit from access to modern family planning services. Table 4 shows World Fertility Survey data on contraceptive use that are available for 11 developing countries. The extent of contraceptive use by women in rural areas and those with no education—who are likely to be poor—can be compared to use among urban women and those with six or more years of education. The countries are grouped by their score on the family planning effort index described above. The percentages indicate the proportion of those using modern contraceptives of the sort provided in family planning programs (pills, IUDs, injections, condoms, female and male sterilization) among women who said they wanted no more children, that is, women who could be expected to be the most likely to use family planning services if available. Women in the countries with stronger programs (by 1972) show smaller differences in contraceptive use by residence and education. (They also have higher rates of contraceptive use generally than their counterparts in the countries with the weakest programs, but this could be due to higher per capita income and other advantages which are correlated with strong family planning programs.)

In Korea and Costa Rica, with strong programs, rural women are almost as likely as urban women to be using modern contraceptives (left panel, Table 4). In Pakistan, Nepal, and Bangladesh, with weak programs, rural women are

only a quarter to a third as likely as urban women to be using modern contraceptives. Differences by education (right panel of the table) also increase as program effort is weaker. They are a scant .05 of a point in Korea and a modest .21 points in Costa Rica, compared to .64 to .89 points in the four countries with weak programs. The smaller differences in countries with stronger programs suggest that rural, uneducated, and probably poor women in countries with weak programs use contraception less because services are less accessible.

The figures in Table 4 also show that in all countries, among women who say they want no more children, the less educated are less likely to be using modern contraceptives. Lower demand is surely part of the reason (even among women who say they want no more children, the better educated may feel more strongly about avoiding future births), but supply differences within countries probably also play a role. Where contraceptives are available only through the private sector, birth control could cost the less educated a substantial portion of their family income. And the rural poor are virtually excluded from access to modern contraceptives and safe abortion if these are available only from doctors, for doctors in developing countries are heavily concentrated in cities. They are at a disadvantage even where family planning programs are administered through health services, as these are nearly always better, and more widespread, in urban areas.

That the poor are at a disadvantage when family planning is not subsidized or administered by the government is seen also in the fact that, in Taiwan, the government-sponsored program effort has had a stronger impact on fertility in the less modern areas, where fertility was high before the program began and unwanted fertility may have been greater.[71] Indeed, in Taiwan, with one of the oldest family planning programs, considerable differentials in birth rates by women's education virtually disappeared between 1966 (soon after an intensive island-wide program began) and 1977, as shown in Figure 8 (page 36).

In most countries, the poor and least educated want larger families than those who are better off. But the stories in Taiwan and Colombia and accumulating evidence from World Fertility Survey-sponsored surveys reveal that they also have much unwanted fertility. It was the heavy toll exacted by botched, illegal abortions that led concerned physicians to press for government support of family planning in Colombia. Today in Peru, where government support of family planning has been erratic, one of five women in Lima's Maternity Hospital is there due to complications following illegal abortion.[72] When other means of birth control are lacking, it is poor women who are most likely to end up suffering the consequences of unsafe, illegal abortion. If for this reason alone, the case for the public provision of family planning services, and ensuring that the poor have access to them, ought no longer to be controversial.

The Outlook

As we have seen, poverty and rapid population growth are mutually reinforcing in a number of ways. On the link from poverty to rapid population growth, there is substantial and growing evidence. Low income, lack of education, and high infant mortality contribute to high fertility and, even with the higher mortality of the poor, assure annual rates of natural increase (births minus deaths) of at least 2 percent and often more among poor groups and in poor countries. Family planning services can help lower fertility and have been shown to do so even among low-income groups. But countries in which such services effectively reach low-income families tend to be countries where these families are also better served in health, education, and other areas and where

there are thus smaller proportions of the population living in utter deprivation.

Regarding the link in the other direction—the impact of rapid population growth on the proportions of poor people—there is some theory but much less hard evidence. Rapid population growth stretches family and national budgets thin with the increasing numbers of children to be fed and educated and workers to be provided with jobs. The probable (though not well-charted) result is slower per capita income growth and lack of progress in reducing income inequality. But there are many other political and social factors which affect economic growth and its distribution and thus the number of the world's poor. How important population growth is relative to these other factors is difficult to quantify. However, it is largely unquestioned that, the more rapid the growth of population in developing countries, the higher the cost and the longer the time required to eliminate poverty.

What does the mutual reinforcement between poverty and rapid population growth imply for the future? The slight but marked downward trend in the population growth rates of developing countries is cause for cautious optimism. The numbers of poor can decline in the next two decades.

In their research on poverty, Chenery and his World Bank colleagues used data available for 36 countries (containing 80 percent of the population of the developing world in 1975, excluding China) to set up a model with which they simulated the effects of various future trends in income growth, income distribution, and population growth on the numbers of people who could be poor in the year 2000.[73] Their "base case" assumes that, for the group as a whole, annual GNP growth will average 6.2 percent over the 1975-2000 period (up from 5.4 percent in 1960-75); population growth will average 2.2 percent a year (down from 2.5 percent in 1960-75); and the share of total income going to the poorest 40 percent of people will be 6.5 percent in 2000 (down from 9.8 percent in 1975). As a result, the absolute poor in these 36 countries would decline from 644 million in 1975, 38 percent of the group's population, to 475 million, or 16 percent of the population, in the year 2000. For the developing world as a whole (excluding China and other centrally planned economies), the number of absolutely poor people in 2000 would be about 600 million, down from 800 million in 1975 (and 780 million in 1980).

An alternative simulation in the model assumes that annual population growth will average 1.97 percent for the 1975-2000 period (which is very close to the World Bank's currently projected rate of 1.91 percent for all developing countries between 1980 and 2000[74]). This produces an estimate of 407 million poor rather than 475 million in these 36 countries in the year 2000. The model does not make allowance for the impact this alternative lower population growth rate might have on income growth and income distribution. Thus the 407 million, as opposed to 475 million, is not so much an alternative projection as a demonstration of how simple arithmetic alone assures a reduction in the numbers of the absolute poor when population growth is slowed. However, if it contributed to faster per capita economic growth, the slower population growth rate would assure still lower numbers of poor people, both because higher average incomes would lift some people out of poverty (income distribution held constant) and because, with higher incomes, fertility could fall even more than already projected—a fortuitous cycle of falling fertility, increasing income, and subsequently greater falls in fertility.

Unfortunately, even the "cautious optimism" which leaves almost half a billion people poor in the year 2000 (in these 36 countries alone) must be tempered. For though some of the projected decline in the numbers of poor people is due to the arithmetic of lower

population growth, much is due to the assumption that total income will continue to grow—and the projected decline in fertility itself assumes continued income growth. Yet income growth in the developing countries may well fall below that projected a few years ago. Projections of income growth for developing countries in the next decade published by the World Bank in 1980 are less optimistic than those published in 1979, largely because of rising energy costs and slow economic growth in the industrialized countries.[75]

With slower average income growth, the numbers of the absolute poor will be greater, the fortuitous cycle turned vicious. Smaller proportions of people will be lifted out of poverty by income gains, and slower income growth among the poor could lead to higher than expected fertility—belying the current projected decline and raising the absolute number as well as the proportion of people below the poverty line. With the prospect of this slower income growth, even if short-term, a development strategy emphasizing the reduction of poverty through more equitable income distribution and improvements in services to the poor may be the best hope for poor countries to escape this vicious cycle of rapid population growth and continuing poverty for so many. □

World Bank photo by Ray Witlin

Waiting for family planning information and health care at a village population center in India. If economic growth slows during the 1980s, a development strategy focused on more equitable income distribution and improved services for the poor may be the best hope for breaking the vicious cycle of rapid population growth and poverty which afflicts so many in the developing world.

References

1. A proper definition of poverty would have to take into account not only people's minimum physical needs (itself difficult enough to measure, given different body structures, metabolic rates, climactic conditions, and so forth), but also some notion of minimum social and political needs, reflecting a society's consensus regarding what human welfare, in its fullest sense, really is. Clearly, such a social consensus will differ among countries and over time. Some simpler measure, however, is necessary and defensible as a guide to examining changes in relation to various policies. A recent review is William P. McGreevey (Ed.), *Third World Poverty: New Strategies for Measuring Development Progress* (Lexington, Mass.: Lexington Books, 1980).
2. The figure of 800 million for 1975 appears in Hollis B. Chenery, "Poverty and Progress—Choices for the Developing World," in *Poverty and Basic Needs*, World Bank, September 1980, p. 30. The figure of 780 million for 1980 appears in The World Bank, *World Development Report, 1980* (Washington, D.C.: 1980) pp. 13 and 33.
3. Chenery, Hollis, with Montek S. Ahluwalia and Nicholas G. Carter, "Growth and Poverty in Developing Countries," in Hollis Chenery, *Structural Change and Development Policy*, A World Bank Research Publication (New York: Oxford University Press, 1979) p. 459. The conversion uses "equivalent purchasing power conversion ratios," estimated by Irving Kravis and associates at the University of Pennsylvania.
4. These statements are based on comparison of the percentage poor in Chenery, Ahluwalia, and Carter with reported data on food expenditures, schooling, and mortality by income groups in the countries named. Detailed references are available from the author.
5. Chenery, Ahluwalia, and Carter, "Growth and Poverty," Table 11.1.
6. For a review of the demographic transition in developed and developing countries, see Jean van der Tak, Carl Haub, and Elaine Murphy, "Our Population Predicament: A New Look," *Population Bulletin*, Volume 34, No. 5 (Washington, D.C.: Population Reference Bureau, 1979).
7. For details and sources, see Nancy Birdsall, *Population and Poverty in the Developing World*, World Bank Staff Working Paper No. 404 (Washington, D.C.: July 1980) Table I-3.
8. van der Tak, Haub, and Murphy, "Our Population Predicament," p. 18.
9. World Bank, *World Development Report, 1980*, Table 17.
10. van de Walle, Etienne and John Knodel, "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Population Bulletin*, Vol. 34, No. 6 (Washington, D.C.: Population Reference Bureau, 1980) Table 8.
11. Palloni Alberto, "Mortality Decline in Latin America," paper presented at the Annual Meeting of the Population Association of America, April 26, 1979, Table 10 and p. 28.
12. Preston, Samuel, "Causes and Consequences of Mortality Declines in Less Developed Countries During the 20th Century," paper presented at the Conference on Population and Economic Change in Less Developed Countries, New York, September 30-October 2, 1976, p. 20.
13. Gwatkin, Davidson, "The End of an Era? Recent Evidence Indicates Unexpectedly Early Slowing of Mortality Declines in Many Developing Countries," paper prepared for the Overseas Development Council, Washington, D.C., July 1979, p. 18, citing Samuel H. Preston and Verne E. Nelson, "Structure and Change in Causes of Death: An International Summary, *Population Studies*, Vol. 28, No. 2 (March 1974) p. 40.
14. Behm, Hugo and Jose Olinto Rueda, "La mortalidad en los primeros anos de vida en paises de la America Latina," Series A, No. 1032, CELADE, September 1977.
15. Potter, Joseph E., "Demographic Factors and Income Distribution in Latin America," paper presented at International Union for the Scientific Study of Population Conference on Demographic and Economic Change: Issues for the 1980's, Helsinki, August 28-September 1, 1979; and Jose Alberto M. de Carvalho and Charles H. Wood, "Mortality, Income Distribution, and Rural-Urban Residence in Brazil," *Population and Development Review*, Vol. 4, No. 3 (September 1978) pp. 405-420.
16. United Nations data compiled by Gwatkin, "The End of an Era?", used in Nancy Birdsall, *Population and Poverty in the Developing World*, World Bank Staff Working Paper No. 404 (Washington, D.C.: 1980) Table I-2, except for Asian data.
17. Mauldin, W. Parker and Bernard Berelson, "Conditions of Fertility Decline in Developing

Countries, 1965-1975," *Studies in Family Planning*, Vol. 9, No. 5 (New York: The Population Council, May 1978) p. 104.

18. *Ibid.*, Table 12, p. 110.
19. *Ibid.*, and David Wheeler, *Human Resource Development and Economic Growth in LDCs: A Simulation Model*, World Bank Staff Working Paper No. 407 (Washington, D.C.: 1980) p. 49.
20. For this view, see Ester Boserup, *The Conditions of Agricultural Growth* (London: Allen and Unwin, 1965); Hirschman, Albert O., *The Strategy of Economic Development* (New Haven, Conn.: Yale University Press, 1958); and Donald R. Glover and Julian L. Simon, "The Effect of Population Density on Infrastructure: The Case of Road Building," *Economic Development and Cultural Change*, Vol. 23, No. 3 (April 1975) pp. 453-468.
21. Sanderson, Warren C., *Economic-Demographic Simulation Models: A Review of Their Usefulness for Policy Analysis* (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1980), provides a critical analysis of seven such models, pointing out the shortcomings of several which attempt to simulate the effect of varying demographic rates on economic growth.
22. Leff, Nathaniel, "Dependency Rates and Savings Rates," *American Economic Review*, Vol. 59, No. 5 (December 1969), using 1964 data from 74 developed and developing countries, examined the association between savings rates and both the young- and old-age components of the dependency burden. He concluded that the size of the dependency ratio significantly affects savings, for all countries together, and developed and developing countries considered separately. But the correlation is reduced if a few demographically atypical Eastern European countries are excluded. See Richard C. Bilsborrow, "Dependency Rates and Aggregate Savings Rates: Corrections and Further Analyses," University of North Carolina, 1973, mimeo.
23. King, Timothy, "How Do the Consequences of Population Growth Differ Among Developing Countries?" Population and Human Resources, World Bank, February 1978, draft.
24. These figures are based on population estimates by age for 1980 used in the World Bank population projections.
25. Lindert, Peter, *Fertility and Scarcity in America* (Princeton, N.J.: Princeton University Press, 1978) chap. 7.
26. World Bank, *Brazil: Human Resources Special Report*, World Bank Country Study (Washington, D.C.: October 1979) Annex II, pp. 32-52.
27. Pinstrup-Anderson, Per and Elizabeth Caicedo, "The Potential Impact of Changes in Income Distribution on Food Demand and Human Nutrition," paper prepared for the Conference on the Economics of Nutrition-Oriented Food Policies and Programs, Bellagio, Italy, August 25-27, 1977, Table 7 and p. 11, Table 8 and p. 12.
28. References to these studies and discussion of them are in Nancy Birdsall, "Analytical Approaches to the Relationship of Population Growth and Development," *Population and Development Review*, Vol. 3, Nos. 1-2 (March and June 1977) pp. 63-102.
29. For references, see Birdsall, "Population and Poverty," p. 37.
30. Wray, Joe D., "Population Pressure on Families: Family Size and Child Spacing," *Reports on Population/Family Planning*, No. 9 (New York: The Population Council, 1971).
31. Preliminary findings, available from the author.
32. For more evidence, see Pravin Visaria, "Poverty and Living Standards in Asia," *Population and Development Review*, Vol. 6, No. 2 (June 1980) pp. 189-223.
33. Selowsky, Marcelo, *Who Benefits from Government Expenditure? A Case Study of Colombia*, World Bank Research Publication (New York: Oxford University Press, 1979); and Jacob Meerman, *Public Expenditure in Malaysia: Who Benefits and Why*, World Bank Research Publication (New York: Oxford University Press, 1979).
34. Birdsall, Nancy, "A Cost of Siblings: Child Schooling in Urban Colombia," in Julian Simon and Julie DaVanzo (Eds.), *Research in Population Economics*, Vol. 2 (Greenwich, Conn.: JAI Press, 1980).
35. See, for example, Robert S. McNamara, *Address to the Massachusetts Institute of Technology, April 28, 1977* (Washington, D.C.: World Bank, 1977); and van der Tak, Haub, and Murphy, "Our Population Predicament."
36. Scrimshaw, Susan C. M., "Infant Mortality and Behavior in the Regulation of Family Size,"

Population and Development Review, Vol. 4, No. 3 (September 1978) pp. 383-403; and van de Walle and Knodel, "Europe's Fertility Transition."

37. See Birdsall, "Population Growth and Development."
38. Becker, Gary S. and H. Gregg Lewis, "Interaction Between Quantity and Quality in Children," *Journal of Political Economy*, Vol. 81, No. 2, Part 2 (March/April 1973) S279-S288.
39. Potter, "Demographic Factors and Income Distribution."
40. See, for example, Frank L. Mott and Susan H. Mott, "Kenya's Record Population Growth: A Dilemma of Development," *Population Bulletin*, Vol. 35, No. 3 (Washington, D.C.: Population Reference Bureau, 1980).
41. Chulalongkorn University, Institute of Population Studies, and National Statistical Office, *The Survey of Fertility in Thailand*, World Fertility Survey Country Report No. 1 (Bangkok: 1977); and Republica de Colombia Corporación Centro Regial de Población, et al., *Encuesta Nacional de Fecundidad Colombia 1976*, World Fertility Survey Country Report No. 1 (Bogota: 1977).
42. Cochrane, Susan H., Nirmala Joshi, and Kalpana Nandwani, "Fertility Attitudes and Behavior in the Terai," World Bank, 1980, mimeo.
43. Cain, Mead T., Syeda Rokeya Khanam, and Shamsun Nahar, "Class, Patriarchy, and the Structure of Women's Work in Rural Bangladesh," Center for Policy Studies Working Papers No. 43 (New York: The Population Council, 1979).
44. For Indonesia: Geoffrey McNicoll, "Institutional Determinants of Fertility Change," Center for Policy Studies Working Papers No. 59 (New York: The Population Council, 1980); and Pi-chao Chen, *Population and Health Policy in the People's Republic of China* (Washington, D.C.: Smithsonian Institution, 1976) pp. 95-100.
45. Results of various studies are reported in William P. McGreevey and Nancy Birdsall, *The Policy Relevance of Recent Research on Fertility* (Washington, D.C.: The Smithsonian Institution, 1974). For Brazil, see World Bank, *Brazil: Human Resources Special Report*.
46. Scrimshaw, "Infant Mortality."
47. Cochrane, Susan H., *Fertility and Education: What Do We Really Know?*, World Bank Occasional Papers No. 26 (Baltimore: Johns Hopkins University Press, 1979).
48. *Ibid.*
49. Cain, Mead T., "The Economic Activities of Children in a Village in Bangladesh," *Population and Development Review*, Vol. 3, No. 3 (September 1977) pp. 201-228; Benjamin White, "The Economic Importance of Children in a Javanese Village," International Institute for the Study of Human Reproduction, Columbia University, 1973, mimeo; M. Vlassoff, "Labour Demand and Economic Utility of Children: A Case Study in Rural India," *Population Studies*, Vol. 33, No. 3 (November 1979) pp. 415-428; and Eva Mueller, "The Economic Value of Children in Peasant Agriculture," in Ronald G. Ridker (Ed.), *Population and Development: The Search for Selective Interventions* (Baltimore: Johns Hopkins University Press, 1976).
50. Cassen, Robert H., *India: Population, Economy, Society* (New York: Holmes & Meier, 1978) pp. 63-74.
51. Shorter, Edward, *The Making of the Modern Family* (New York: Basic Books, 1977).
52. Birdsall, "A Cost of Siblings."
53. For detailed references, see Birdsall, "Population and Poverty," p. 52.
54. Actually, prevailing levels of malnutrition probably do not reduce fecundity (John Bongaarts, "Malnutrition and Fecundity: A Summary of Evidence," Center for Policy Studies Working Papers No. 51, The Population Council, December, 1979), but famine and disease could.
55. Kirk, Dudley, "A New Demographic Transition?" in *Rapid Population Growth: Consequences and Policy Implications* (Baltimore: Johns Hopkins Press for the National Academy of Sciences, 1971) estimated that threshold to be as low as $125 (1965 prices) per person and about $400 in Latin American countries. Clive Bell, "Fertility, Mortality, and the Standard of Living," World Bank, June 24, 1976, draft, reports only minimal fertility decline until per capita income reaches $300 (1970 prices and data).
56. Repetto, Robert, "The Interaction of Fertility and Size Distribution of Income," 1974, mimeo, Table 6, pp. 29-30.

57. Morawetz, David, "Basic Needs Policies and Population Growth," *World Development*, Vol. 6, No. 11-12 (1978) Table 1, p. 1253.
58. This point is made most forcefully by Robert Repetto, *Economic Equality and Fertility in Developing Countries* (Baltimore: Johns Hopkins University Press for Resources for the Future, 1979).
59. Based on *ibid.*, Table 6-4, p. 166.
60. Wheeler, "Human Resource Development and Economic Growth," Appendix D.
61. Mauldin, W. Parker, "Patterns of Fertility Decline in Developing Countries, 1950-1975," *Studies in Family Planning*, Vol. 9, No. 4 (April 1978) Table 7, p. 82.
62. Nortman, Dorothy L. and Ellen Hofstatter, *Population and Family Planning Programs: A Compendium of Data Through 1978*, A Population Council Fact Book, 10th ed. (New York: 1980) p. 86.
63. Mauldin and Berelson, "Conditions of Fertility Decline in Developing Countries, 1965-1975."
64. Wheeler, "Human Resource Development and Economic Growth in LDCs."
65. Chen Muhua, Vice Premier of the People's Republic of China, "Realization of the Four Modernizations Hinged on Planned Control of Population Growth," *People's Daily*, August 11, 1979.
66. Banister, Judith, "Strengths and Weaknesses of China's Population Data," paper presented at the Hawaii Conference of Population in China, May 1980.
67. Chen, Pi-chao, estimate presented at the Workshop on Population Research in the People's Republic of China, National Academy of Sciences, Washington, D.C., October 28, 1980.
68. Mauldin, "Patterns of Fertility Decline" for the 1960 estimate. For 1978, the World Bank *(World Development Report, 1980)* reports 37 and the Population Reference Bureau *(1980 World Population Data Sheet)* reports 35.
69. U.S. Agency for International Development (1974 estimate); and Suwardjono Surjaningrat et al., "Indonesia," in J. Jarrett Clinton and Jean Baker (Eds.), "East Asia Review 1978-79," *Studies in Family Planning*, Vol. 11, No. 11 (November 1980) Table 3, p. 322.
70. Freedman, Ronald, "Theories of Fertility Decline: A Reappraisal," in Philip Hauser (Ed.), *World Population and Development: Challenges and Prospects* (Syracuse, N.Y.: Syracuse University Press, 1979) p. 73.
71. Hermalin, Albert I., "Empirical Research in Taiwan on Factors Underlying Differences in Fertility," *Studies in Family Planning*, Vol. 5, No. 10 (October 1974) p. 319.
72. Daubon, Ramon, *The Development of a Peruvian Population Policy* (Washington, D.C.: Battelle Memorial Institute, 1980); and "A Backward Step for Womankind in Peru," *Intercom*, November/December 1979, p. 5.
73. Chenery, Ahluwalia, and Carter, "Growth and Poverty in Developing Countries."
74. Zachariah, K. C. and My Thi Vu, *Population Projections 1980-2000, and Long-Term (Stationary Population)*, World Bank, July 1980, unpublished document, p. 7.
75. World Bank, *World Development Report*, 1980, p. 3.

Selected Bibliography

Nancy Birdsall, author of this *Population Bulletin*, suggests the following for those interested in reading more about the relationship between rapid population growth and the socioeconomic characteristics of poverty, particularly unequal income distribution and lack of education.

Becker, Gary S. and H. Gregg Lewis, "Interaction Between Quantity and Quality in Children," *Journal of Political Economy*, Vol. 81, No. 2, Part 2 (March/April 1973) S279-S288.

Behm, Hugo and Jose Clinto Rueda, "La Mortalidad en los Primeros Anos de Vida en Paises de la America Latina," Series A., No. 1032, CELADE, September 1977.

Birdsall, Nancy, "Analytical Approaches to the Relationship of Population Growth and Development," *Population and Development Review*, Vol. 3, No. 1-2 (March and June, 1977) pp. 63-102.

Cassen, Robert H., *India: Population, Economy, Society* (New York: Holmes & Meier, 1978).

Chenery, Hollis, with Montek S. Ahluwalia and Nicholas G. Carter, "Growth and Poverty in Developing Countries," in Hollis Chenery, *Structural Change and Development Policy*, A World Bank Research Publication (New York: Oxford University Press, 1979) pp. 456-495.

Cochrane, Susan H., *Fertility and Education: What Do We Really Know?*, World Bank Staff Occasional Papers No. 26 (Baltimore: Johns Hopkins University Press, 1979).

Gwatkin, Davidson, "The End of an Era? Recent Evidence Indicates Unexpected Changes in the Pace and Pattern of Third World Mortality Declines," Overseas Development Council, Washington, D.C., May 1980.

Kirk, Dudley, "A New Demographic Transition?" in *Rapid Population Growth: Consequences and Policy Implications* (Baltimore: Johns Hopkins Press for the National Academy of Sciences, 1971).

Kuznets, Simon, "Demographic Aspects of the Size Distribution of Income: An Exploratory Essay," *Economic Development and Cultural Change*, Vol. 25, No. 1 (October 1976) pp. 1–94.

Lindert, Peter, *Fertility and Scarcity in America* (Princeton, N.J.: Princeton University Press, 1978).

Mauldin, W. Parker and Bernard Berelson, "Conditions of Fertility Decline in Developing Countries, 1965-1975," *Studies in Family Planning*, Vol. 9, No. 5 (May 1978).

Morawetz, David, "Basic Needs Policies and Population Growth," *World Development*, Vol. 6, No. 11-12 (1978).

Potter, Joseph E., "Demographic Factors and Income Distribution in Latin America," paper presented at the International Union for the Scientific Study of Population Conference on Demographic and Economic Change: Issues for the 1980s, Helsinki, August 29-September 1, 1979.

Repetto, Robert, *Economic Equality and Fertility in Developing Countries* (Baltimore: Johns Hopkins University Press for Resources for the Future, 1979).

Ridker, Ronald (Ed.), *Population and Development: The Search for Selective Interventions* (Baltimore: Johns Hopkins University Press, 1976).

Welch, Finis, "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust," *Journal of Political Economy*, Vol. 87, No. 5, Part 2 (October 1979) pp. 565-597.

Wheeler, David, "Human Resource Development and Economic Growth in LDC's: A Simulation Model," World Bank Staff Working Paper No. 407 (Washington, D.C.: 1980).

World Bank, *World Development Report, 1980* (Washington, D.C.: 1980).

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